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October 31st, 1947
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Washington Highlights

The Supreme Court has declined to reconsider or reverse its decision of last June which ruled that the Federal Government has paramount rights to California oil-rich tidelands.

California had previously requested the high court for a rehearing of the case, alleging the decision was contrary to precedence and in effect would deprive every Coastal state of vast areas and property rights of great value.

Although the Federal claim covered lands between lowwater mark and the three-mile limit, it did not include bays, ports, harbors and lands amidst high and low-water line.

California's petition for review of the decision pointed out that:

"There is absolutely nothing upon which the Federal claim can be predicated except the unsupported declaration of the majority of the court that national power gives the Federal Government the right to appropriate these properties, a proposition which we have shown is contrary to all past decisions.

"If this decision should stand, no one today could foretell the extent to which future Federal administrations may go in asserting the right to expropriate private property and rights on basis of the vague concept of national power."

The tidelands case was decided by a 6 to 2 vote. Justice Black wrote the majority opinions. Dissenters were Justice Reed and Frankfurter. Justice Jackson was not a participant.

The decision of the court is viewed by all segments of the nation's petroleum industry as a definite challenge to the sovereignty and constitutional rights and powers of the states.

Congress at the next session, from all signs, will be called upon to quitclaim title of tidelands to the several states.

Trans-Arabian Pipe Line Co. has been issued a license by the Commerce Department to export 20,000 tons of steel during the fourth quarter of 1947. The department said the steel would be used for the construction of a pipeline which would permit a more competitive transportation cost and greatly increase the incentive for more rapid development of Middle East fuel supply for world markets.

This, the department added, would permit earlier relief to the present drain on reserves of petroleum in the Western Hemisphere. The new line will run 1140 miles from Abqaeq in Saudi Arabia to the Mediterranean near Sidon in Lebanon. To complete the oil carrier approximately 305,000 tons of steel will be needed. The department doubtless will authorize succeeding shipments in order to complete the line projected.

Considerable attention is being given in Washington to the American Petroleum Institute's public relations program. Of chief interest was the institute's report that the development of new products was adding to the demand factor.

The API explained that a relatively new market for kerosene is in the tobacco growing industry where farmers are changing to this type of fuel in preference to wood for curing operations.

In addition to being a supplier of butadiene and toluene, the petroleum industry is an important source of many chemical products, including glycerine and alcohols. A wide variety of oil chemicals are used in the preparations of medicine, weed destroyers, cosmetics and insecticides.

Major oil companies processed more crude petroleum in the first six months of 1947 than in the similar period of last year and transported 14 per cent more refined products through their own bulk stations and purchased an increasing amount of refined products from independent refineries in this period. This report was released by Senator Wherry's oil sub-committee of the Senate's Small Business Committee.

United States established an all-time peak in rotary drilling during September, a total of 2007 rotary rigs being active at the end of the month. The increase in rotary drilling has been gradual since February at which time 1594 rigs were running. The figure at the end of March was 1637, April 1651, May 1748, June 1873, July 1909 and August 1969.

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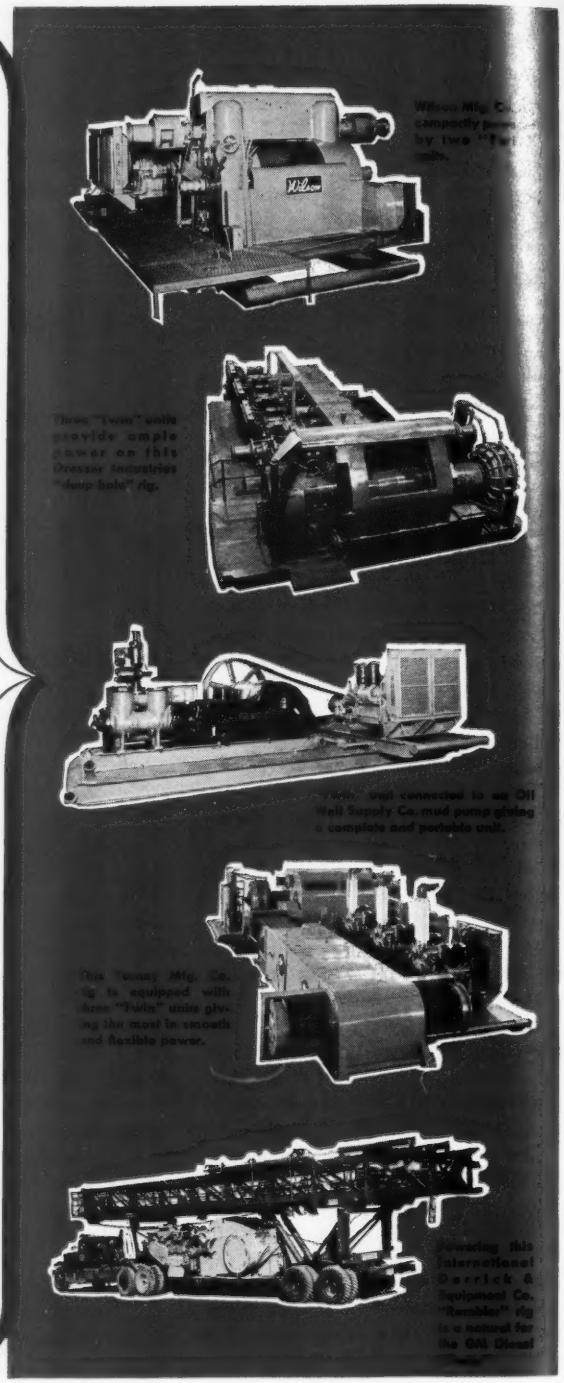

Three "Twin" units provide ample power on this Dresser Industries "deep hole" rig.

"Twin" unit connected to an Oil Well Supply Co. mud pump giving a complete and portable unit.

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Centrifugal Compressor Installation at the Seeligson Project

By Dan T. McDonald

I. Introduction

Each of you has heard of centrifugal compressors. A lot of you have talked with centrifugal compressor sales engineers. Some of you have seen centrifugal compressors in operation. If you have worked in a modern refinery or a steel mill, you may have operated centrifugal compressors. If all of your industrial experience has been in the natural gas and gasoline business, then I believe I am justified in assuming that your experience, like ours in the Mid-Continent, has been confined entirely to reciprocating gas compressors.

For those of you who join us in this latter category, I will endeavor to present the story of the centrifugal compressor installation at the Seeligson Project. This story may be developed by answering the following questions:

1. What is the Seeligson Project?
2. What is a centrifugal compressor?
3. How does it compress gas?
4. In what manner do you install a centrifugal compressor?
5. How much does it cost to install a centrifugal compressor?
6. How much does it cost to operate a centrifugal compressor?
7. How does the centrifugal compressor fit into gasoline plant service?

I will endeavor to present the answers to these questions in much the same manner that the Seeligson Plant Design and Construction Committee developed them.

II. What is the Seeligson Project

The Seeligson Project is a jointly-owned gas processing plant, which is being planned and constructed for the purpose of eliminating the flaring of casinghead gas produced from crude oil separators and for the cycling of distillate-bearing gas reservoirs in the Seeligson Field of Southwest Texas. The plant is being designed for an ultimate gas processing capacity of 70,000 MCF/Day of casinghead gas and 150,000 MCF/Day of distillate-bearing gas. The residue from the casinghead gas will be delivered to pipeline transmission outlets, while the residue from the distillate-bearing gas will be cycled. The centrifugal compressors will be installed in the casinghead gas compression plant, therefore we will confine our discussion to that portion of the plant.

The casinghead gas is separated from crude oil at atmospheric pressure at 170 batteries. Gathering lines are designed to deliver the gas to the plant master meters at 9.5" Hg vacuum. The gas will be compressed from 10" Hg vacuum through four stages to 1015 psia. The low stage will be compressed with steam turbine driven centrifugal compressors and the three higher stages will be be compressed with gas engine driven reciprocating compressors. The gas will be be processed at 1000 psia, with the residue dehydrated and delivered to the pipeline at a maximum of 950 psia.

With this description of the scope of the operations as a background, let us discuss the technology and economics of centrifugal compressors.

III. What is a Centrifugal Compressor?

A centrifugal compressor is nothing more than a centrifugal pump for compressible fluids. The prime mover in industrial applications is usually either a steam turbine or an

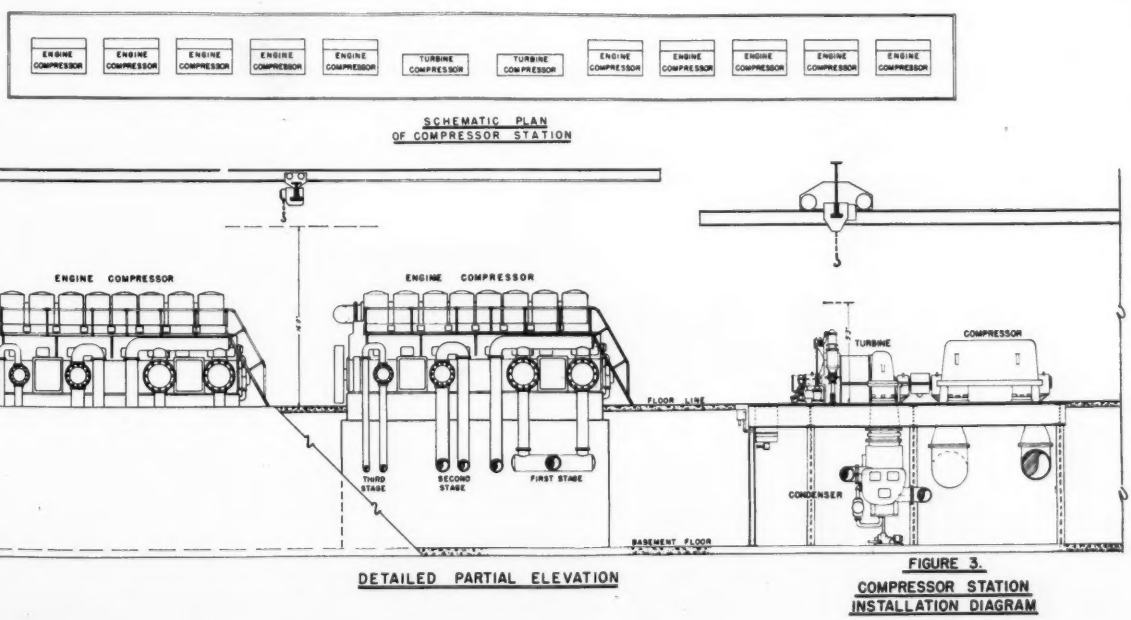
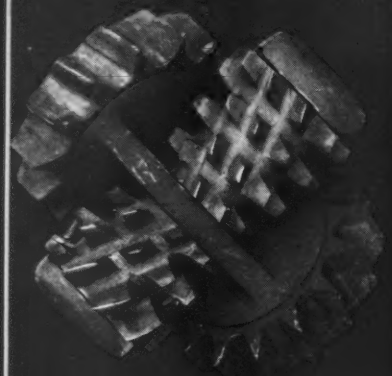


FIGURE 3.
COMPRESSOR STATION INSTALLATION DIAGRAM



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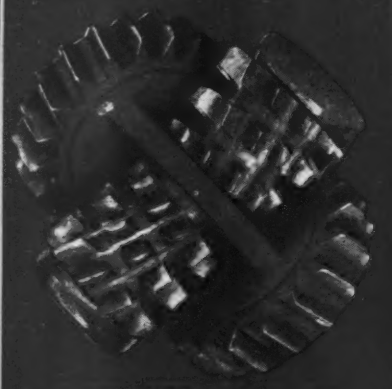
TYPE C-2C



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electric motor. The maximum rotative speeds are governed by the peripheral tip speed of the compressor impellers, with the average range of rotative speed being between 3000 and 6000 rpm. In appearance the centrifugal compressor and prime mover are very similar to a turbo-generator. Fig. 1 shows a turbine driven, multi-stage centrifugal compressor in a steel mill installation. Fig. 2 shows a view of the same type of unit with the turbine and compressor covers removed.

IV. How Does it Compress Gas?

The theory of centrifugal gas compression is analogous to the theory of centrifugal pumps, the only difference being in the compressibility of the fluid being pumped. An excellent treatise on centrifugal compressor theory will be found in "Centrifugal Pumps and Blowers" by Church (1). "Mark's Mechanical Engineers Handbook" (2) also has a section devoted to this subject. For our discussion it might be well to touch only lightly on the pertinent features to the principles of centrifugal compression. The pressure which can be developed is primarily a function of the density of the gas being pumped and its ratio of specific heats. Thus, the same compressor will deliver a higher discharge pressure when pumping propane than when pumping methane. The horsepower requirements are calculated as a polytropic work function in essentially the same manner as for reciprocating compressors — the prime difference being in the mechanical efficiency values. The centrifugal compressor is very adept at delivering a wide range of gas volumes at constant discharge and suction pressures. This is accomplished by speed variation. In a later section this flexibility factor will be more fully explored.

V. Installation

The plans at Seeligson call for the ultimate installation of 10 1600 hp Clark BA gas engine driven reciprocating compressors for the three high stages and two Ingersoll-Rand 36,500 c.f.m. turbine-driven, six-wheel centrifugal compressors for the low stage. The centrifugals will operate in parallel and discharge into the reciprocator master suction header. The reciprocators will operate in parallel with three stages per machine. Two low-stage cylinders, one intermediate, and one high-stage cylinder will be mounted on the Clark units.

The casinghead compressor building will be 430′ long by 36′ wide and will have a full basement. The centrifugals will be set with shafts in line with the length of the building at the center of the building. Five reciprocators will be set, with shafts in line with the length of the building, at either side of the centrifugals. All gas, steam, and water piping will be in the basement. Condensers will be suspended from the belly of the turbines. Fig. 3 shows a plot plan and an

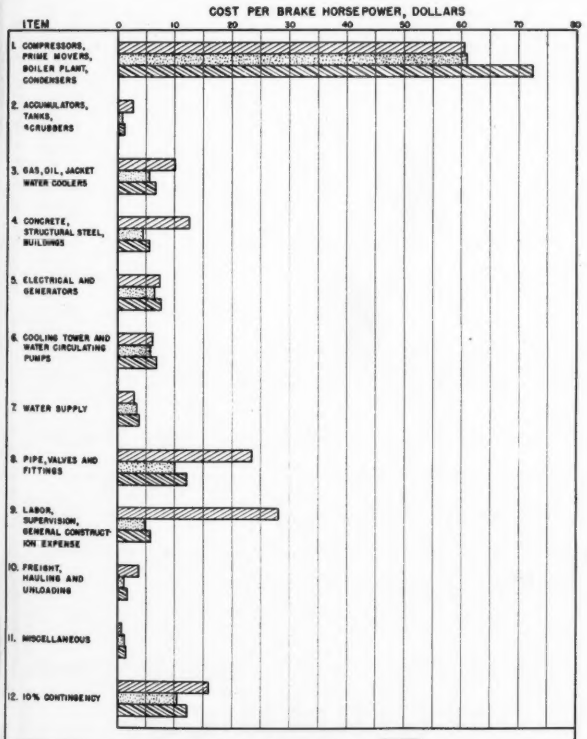

FIGURE 4.
COMPARISON OF INVESTMENT COST OF RECIPROCATING & CENTRIFUGAL COMPRESSOR STATIONS

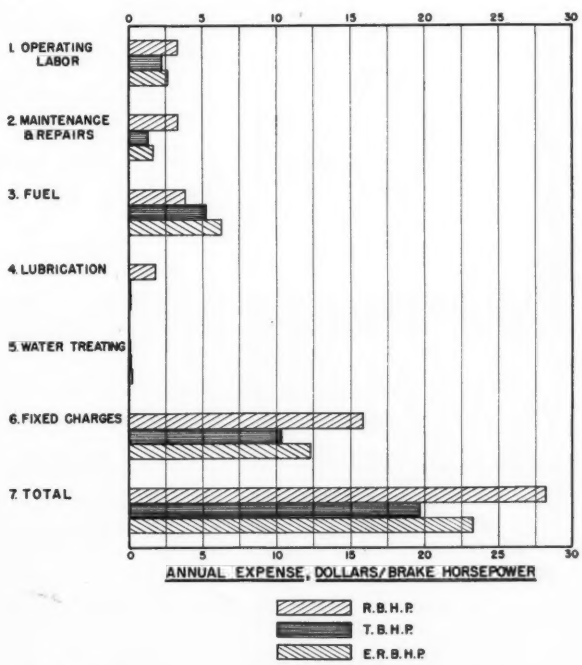

FIGURE 8.
ANNUAL DIRECT EXPENSE COMPARISON BETWEEN CENTRIFUGALS & RECIPROCATORS SEELIGSON PROJECT

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elevation section of the compressor station layout.

It is interesting to note that each centrifugal is replacing two and one-fourth 1600 hp reciprocators, but the floor space requirements in the compressor building are approximately that of only one of the replaced reciprocators. It is also interesting to note that the centrifugals are in effect replacing 14 - 38" reciprocating cylinders, the lead lines to which would have been 24".

The turbines are I-R impulse type and are to be driven by 600 psig 825°F steam, which will be fully condensed at 27" Hg vacuum. No process steam is to be bled from the turbines. The steam will be generated in B&W Type FH, integral furnace, gas-fired, induced draft boilers. These boilers are rated to deliver 75,000#/hr of steam at an overall efficiency of 76% without air preheaters. An efficiency of 83% could be obtained with preheaters and economizers. The plant normal process steam requirements are about 82,000#/hr taken from back-pressure process turbines and the centrifugal compressor normal steam requirements are about 53,-500#/hr. Thus, two boilers easily carry the normal plant load. Boiler feed pumps and draft fans will be turbine-driven.

The plant water supply will be taken from wells drilled on the plant site. The water analysis is shown in Table I. For cooling tower service the water will be treated with chlorine, sulfuric acid, and stabilizer. For boiler feed make-up, an evaporator will be used. Boilers will be given sulfite, phosphate, and caustic internal treatment.

Gas coolers will be shell-and-tube type with treated cooling tower basin water at the cooling medium. Cooling tower will be induced draft type using motor-driven fans. Centrifugal compressor turbine steam will be condensed in I-R condensers. Condensate return pumps will be motor-driven.

VI. What is the Installation Cost?

This question has provoked considerable discussion among the people responsible for designing and building natural gas compression stations. The answer to the question loses much significance unless a direct comparison is made with the cost of installing reciprocating compressors. Other industries, notably the steel, have practically abandoned reciprocating air compressors in favor of centrifugals. The refining refrigeration, and manufactured gas industries have followed the lead of the steel industry. These conversions were undoubtedly dictated by sound engineering and economics.

It is a difficult problem to make an accurate and equitable investment cost comparison between centrifugals and reciprocators. One cannot safely generalize on the relative cost of installing one in favor of the other. In the specific case of the Seeligson Project, we have made a detailed estimate of the relative investment costs. This estimate is inaccurate in that the reciprocating costs are for the three stages from centrifugal discharge to 1000 psig, whereas the centrifugal estimate is for the stage below the reciprocators. It is believed that the comparison will not be affected unduly by this assumption

Table I

Water Supply Analysis and Estimated Treating Cost

A. Water Analysis

Hypothetical Combination	Parts Per Million	Grains Per Gallon
Silica	39.00	2.27
Iron and Aluminum Oxide	12.00	0.70
Magnesium Bicarbonate	22.69	1.32
Calcium Bicarbonate	58.32	3.40
Sodium Bicarbonate	232.68	13.57
Sodium Sulfate	35.50	2.07
Sodium Chloride	679.77	39.66
Total	1,079.96	62.99

pH = 8.0
Non-Incrusting Solids = 7.9 #/1000 gallons
Incrusting Solids = 1.1 #/100 gallons
Soap Hardness = 2.2 grains/gallon

B. Treating Cost

1. Cooling Tower:	Sulfuric Acid	$0.0015	per 1000 Gal.
	Stabilizer	0.0015	"
	Chlorine	0.0025	"
	Total	0.0055	"
2. Boiler Feed:	Sodium Sulfite	$0.0035	per 1000 Gal.
	Sodium Hydroxide	0.0010	"
	Alum	0.0031	"
	Total	0.0076	"
		0.0009	per 1000#
3. Boiler Internal: (Make-Up)	Sodium Hydroxide	$0.0139	per 1000 Gal.
	Phosphate	0.0833	"
	Total	0.0972	"
		0.0117	per 1000#

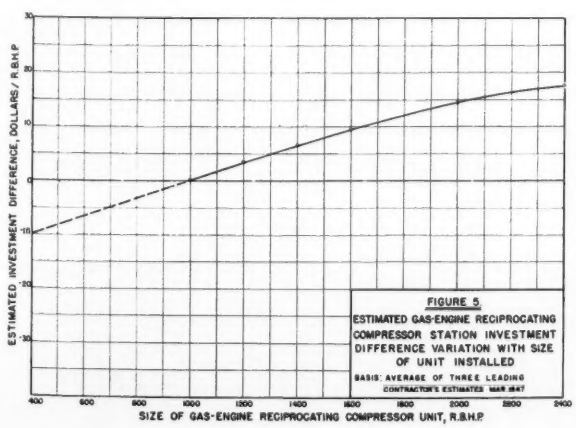

FIGURE 5
ESTIMATED GAS-ENGINE RECIPROCATING COMPRESSOR STATION INVESTMENT DIFFERENCE VARIATION WITH SIZE OF UNIT INSTALLED
BASIS: AVERAGE OF THREE LEADING CONTRACTOR'S ESTIMATES MAR 1947

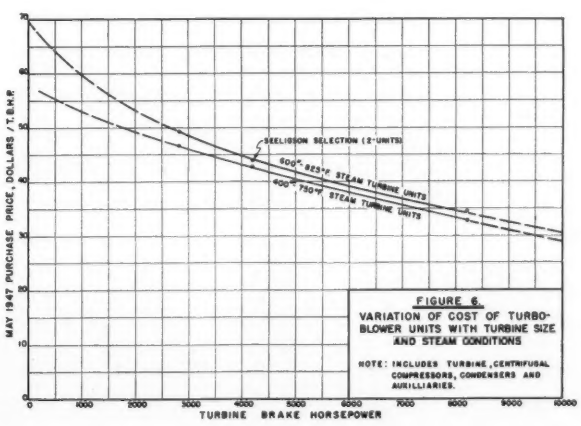
MAY 1947 PURCHASE PRICE, DOLLARS / T.B.H.P.
SEELIGSON SELECTION (2 UNITS)
900#, 825°F STEAM TURBINE UNITS
400 - 750°F STEAM TURBINE UNITS
TURBINE BRAKE HORSEPOWER

FIGURE 6.
VARIATION OF COST OF TURBO-BLOWER UNITS WITH TURBINE SIZE AND STEAM CONDITIONS
NOTE: INCLUDES TURBINE, CENTRIFUGAL COMPRESSORS, CONDENSERS AND AUXILLIARIES.

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of equivalent service.

In Table II will be found the detailed investment cost estimate for the 70,000 MCF/Day casing-head gas compressor station. These costs are extracted from a turnkey bid on the complete plant by Hudson Engineering Corporation, dated July 15, 1947 (3). Certain of the included items are mutual service. It was necessary to evaluate these mutual items upon a pro rata basis. From the tabulation, it is indicated that the reciprocators will cost $174 per RBHP (reciprocating brake-horsepower), and the centrifugals will cost $115 per TBHP (turbine brake-horsepower). It is important to note that 1.0 TBHP is equivalent to only 0.84 ERBHP (equivalent reciprocating brake-horsepower) at 95% overall efficiency of the reciprocator. Thus, when the centrifugals and reciprocators are evaluated on an equivalent basis the cost is $137 per ERBHP as compared to $174 per RBHP, or a saving of $37 per ERBHP installed in the station.

Table II

Estimated Cost of Installing Centrifugal and Reciprocating Compressor Station

Item	8,400 TBHP Centrifugals		16,000 RBHP Reciprocators
	Per TBHP	Per ERBHP	Per RBHP
Scrubbers	$ 0.80	$ 0.96	$ 2.04
Fuel Volume Tanks	0.01	0.01	0.11
Raw and Jacket Water Tanks	0.01	0.01	0.40
Lube Oil Tanks	0.06	0.07	0.13
Gas Coolers	5.45	6.49	7.55
Jacket Water Coolers	0.10	0.11	2.52
Generators (with standby)	3.93	4.68	4.52
Generator Switchboard	0.76	0.90	0.88
Electrical Fixtures	1.77	2.11	2.04
Boiler Plant (erected with standby)	16.31	19.41	.....
Deaerating Heater	0.61	0.73	.....
Cooling Water Circulating Pumps	0.70	0.83	0.56
Jacket Water Pumps	0.03	0.04	0.79
Cooling Tower (erected)	5.04	6.00	4.66
Raw Water Supply	3.18	3.78	2.94
Compressor Building	2.78	3.31	3.85
Generator Building	0.25	0.29	0.33
Concrete	0.89	1.06	6.25
Compressors, Gas-Engine	.....	.....	60.44
Compressors, Turbo-Blowers	39.67	47.23	.....
Condensers and Auxiliaries	4.41	5.24	.....
Starting Air Compressors	0.01	0.01	0.10
Structural Steel and Pipe Clamps	0.60	0.71	2.19
Instruments, Controls, Specialties	0.36	0.43	0.22
Insulation (installed)	0.89	1.06	0.22
Paint	0.06	0.07	0.10
Pipe, Valves, Fittings	10.12	12.04	23.42
General Construction Expense	0.12	0.14	1.25
Labor, Supervision, Insurance	4.76	5.67	26.86
Freight, Unloading, Hauling	1.19	1.42	3.75
Sub-total	$104.87	$124.81	$158.12
Contingency @ 10%	10.49	12.48	15.81
Grand Total	$115.36	$137.29	$173.93

Note: 1. Reciprocating brake-horsepower (RBHP) as rated by Clark Bros. Co., Inc. at 300 rpm.
2. Turbine brake-horsepower (TBHP) as rated by Ingersoll-Rand at 3870 rpm for 600 psig—750°F steam expanded to 3" Hg absolute backpressure and fully condensed. Water rate @ 7.75 #/TBHP.
3. Equivalent reciprocating brake-horsepower (ERBHP) is computed at full rated load for gas at 0.75 sp.gr., 1.21 sp.ht. ratio, 90°F suction temperature. 1.0 TBHP=0.84 ERBHP @ 95% overall reciprocator efficiency.

The investment cost comparisons are shown graphically in Fig. 4. Here the station cost is sub-divided into common investment accounts for simplicity. It is readily seen that the investment savings are made in construction items such as labor, piping, and structural. Auxiliary costs are greater for the centrifugals. Both of these conclusions are expected from a qualitative consideration. The main unit cost (Item I) is indicated to be greater for centrifugal. The boiler plant, however, is erected. On an unerected basis the equivalent horsepower cost would be very comparable.

It can be reasonably argued that the costs might have been different if different sized machines had been used, or if a different sized station was being considered. Let us briefly consider these factors.

At Seeligson the size of the station was dictated by the anticipated field development and performance. The Plant Committee wanted a station with much flexibility to handle flush volumes and erratic flowing schedules. It was assumed that reciprocators of 1000 BHP and larger would offer the more economical installation. The three contractors bidding on the plant were requested to furnish the Plant Committee with a comparative cost estimate for installing 1000, 1200, 1600, and 2400 BHP units for an immediate capacity of 50,000 MCF/Day and an ultimate capacity of 70,000 MCF/Day. The curve shown in Fig. 5 is an average of the contractors' estimates. The curve may be used as a basis for adjusting the cost estimate in Table II for sizes of reciprocators other than 1600 BHP.

The comparative cost estimate would also be influenced by the size of the centrifugal units installed. It was the decision of the Plant Committee to use more than one unit but not more than three. The turbine horsepower selected for the the job was 8,400 using 600 psig 825°F steam condensed at 27" Hg vacuum. Fig. 6 is a plot of the

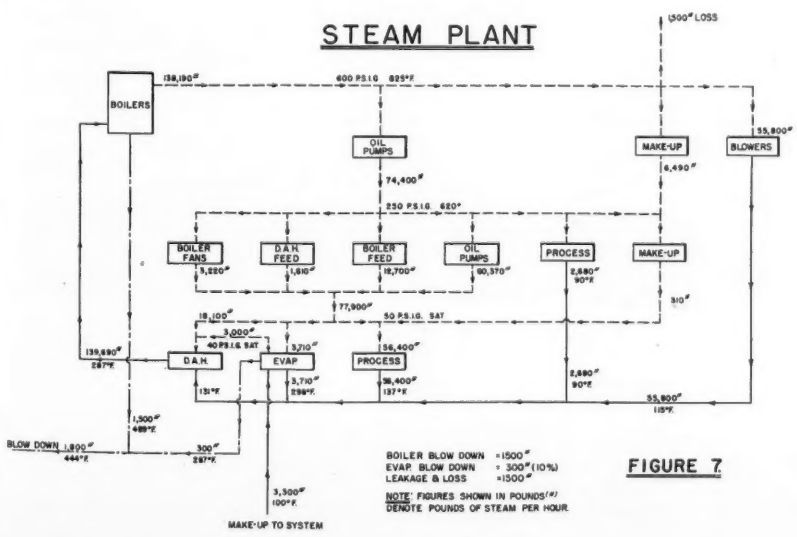

FIGURE 7

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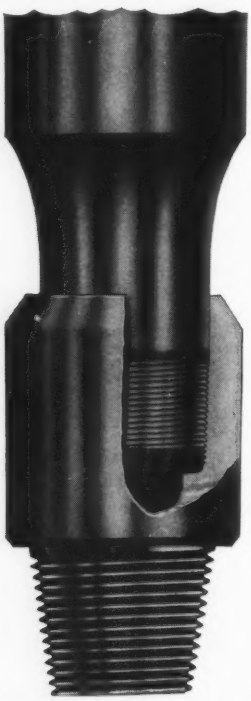

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variation of the purchase cost of the centrifugal units (with condensers, ejectors, etc. for two steam conditions and for various turbine horsepower ratings. The data used to plot the curve are from one manufacturer's bid. These curves should serve as a partial index for adjusting the investment costs in Table II for change in number, size, or steam conditions of centrifugal compressor units. It should be noted that installation costs are not included, only the purchase cost of the basic unit.

In summary, it is indicated that the centrifugals to be installed at Seeligson will yield a net saving to the Operators of about $37 per ERBHP. This is about 21%, or $260,000, on the low stage of the station.

VII. What is the Operating Cost?

The true answer to this question can be developed only after a number of years of comparable operation at the same plant under the same management. As engineers we must take the best data available, weigh it very carefully, and make the best decision we possibly can. In this case we have had to gather our data from various sources and have attempted to correlate them in as fair and as realistic a manner as possible. It cannot be emphasized too strongly that these data are such that the correlations are at best just good estimates.

Let us develop the answer as best we can from the data which we have been able to collect. Two interlocking thoughts must be carried through this discussion. They are the energy and the monetary evaluations. The energy evaluation is fundamental, but the monetary evaluation is a function which varies with local economic conditions.

From a qualitative consideration it would appear that the centrifugal compressor installation would be cheaper to operate and maintain because of larger sized units and fewer moving, wearable parts. On the other hand, if the centrifugal is not as efficient thermodynamically, the overall energy consumption is greater. Thus, we have the problem of establishing the net balance between the two for the specific case at Seeligson.

Reciprocators have been operated in our industry for many years under many sorts of operating conditions. The costs used for the reciprocators will not be discussed in detail. The costs for the centrifugals should be explored in greater detail before we attempt to find the net balance.

1. Turbine and Compressor

The turbine and compressor unit has only four main bearings to lubricate and wear. The impeller and rotor blades are sources of erosion and corrosion, but these factors are minimized by prudent design.

In Table III will be found the maintenance and lubrication cost record of the blast furnace turboblower units at a large steel mill (5). This plant installed five 6800 TBHP units in 1926, one unit being a complete spare. In 1939 one 8500 TBHP unit was added, and in 1943 another 8500 TBHP unit was added. The cost record ends in September, 1944, with a total of 18.25 years of accounting records on the maintenance and lubrication of the blower installation. The actual operating horsepower per year have been tabulated and used for computing the $/BHP/yr. columns. The average maintenance labor and materials cost was $0.2547 per operating BHP/yr. The average lubrication cost was $0.0083 per operating BHP/yr.

A factor which has been attributed to the centrifugal compressors' credit is its high on-steam factor. Table IV shows the normal inspection record and the emergency shut-down record on the blowers listed in Table III. The normal inspection time on an 11,000 TBHP size unit is 32 manhours per end, or 64 manhours per turbo-blower unit. The more modern air-cooled blowers are normally used in preference to the water-cooled blowers. With the air-cooled units a maintenance schedule of less than 32 manhours per year could be expected.

The emergency shutdowns are impressive in that there were only five over an 18-year period. None of the shutdowns involved a costly or time-consuming repair job.

2. Condenser and Auxiliaries

This equipment consists of a surface steam condenser, condensate return pump and driver (spared), and air ejector. Treated cooling tower basin water, entering at 85°F and leaving at 104°F, will be used for condensation of the steam at 27" Hg vacuum. Surface is 133% of clean surface requirements. It is anticipated that this equipment will be serviced only during bi-ennial blower inspection. With treated water, tubes are expected to have a 15-year minimum life. Acid cleaning about once in five years is an-

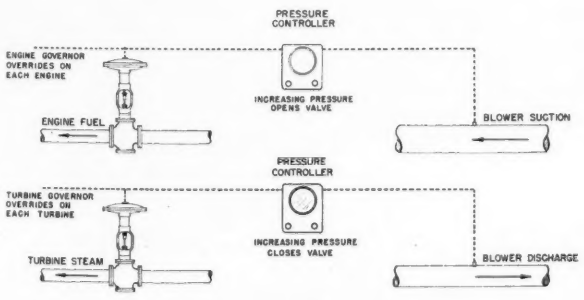

FIGURE 9.

SCHEMATIC INSTRUMENTATION DIAGRAM OF CENTRIFUGAL & RECIPROCATOR CONTROL

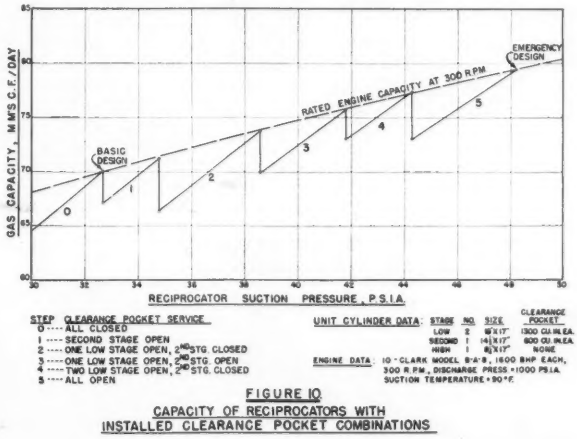
GAS CAPACITY, M M'S C.F./DAY
RECIPROCATOR SUCTION PRESSURE, P.S.I.A.
EMERGENCY DESIGN
RATED ENGINE CAPACITY AT 300 R.P.M.
BASIC DESIGN
0
1
2
3
4
5
STEP CLEARANCE POCKET SERVICE
0 ---- ALL CLOSED
1 ---- SECOND STAGE OPEN
2 ---- ONE LOW STAGE OPEN, 2ND STG. CLOSED
3 ---- ONE LOW STAGE OPEN, 2ND STG. OPEN
4 ---- TWO LOW STAGE OPEN, 2ND STG. CLOSED
5 ---- ALL OPEN
UNIT CYLINDER DATA: STAGE NO. SIZE CLEARANCE POCKET
LOW 2 16"X17" 1300 CU. IN. EA.
SECOND 1 14"X17" 600 CU. IN. EA.
HIGH 1 8"X17" NONE
ENGINE DATA: 10 - CLARK, MODEL 8-X-8, 1600 BHP EACH, 300 R.P.M., DISCHARGE PRESS. = 1000 P.S.I.A. SUCTION TEMPERATURE = 90°F.

FIGURE 10

CAPACITY OF RECIPROCATORS WITH INSTALLED CLEARANCE POCKET COMBINATIONS

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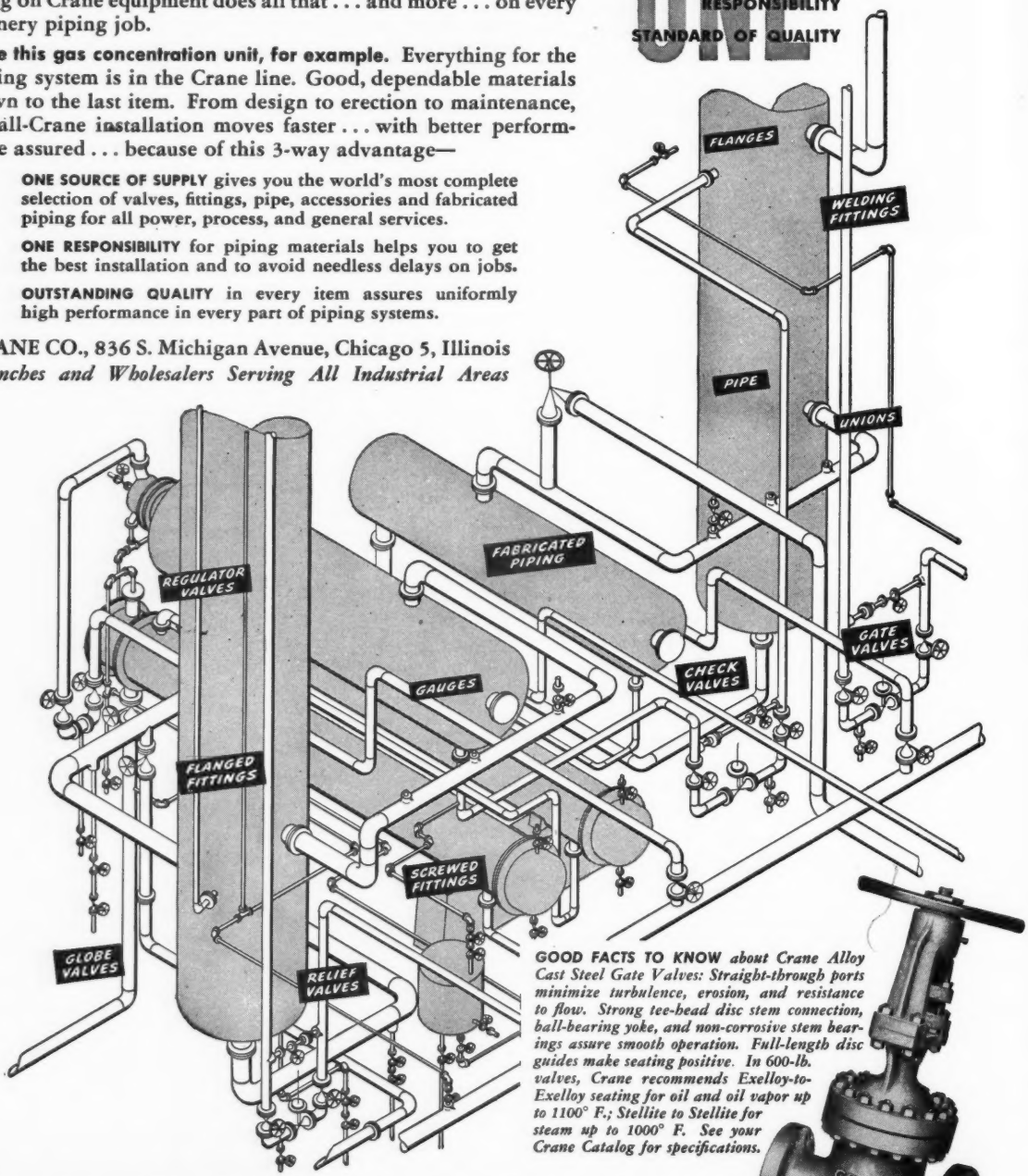

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AND HEATING

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FOR EVERY PIPING SYSTEM

ticipated. The condenser maintenance cost of a large utility company, using untreated water, is less than $0.0005 per square foot per year.

3. Boiler and Auxiliaries

Boilers will be fired at about 95% of rated load, with a standby unit. Evaporated water will be used on make-up. A deaerating heater will be used on the boiler feed. Boiler efficiency is 76% without air preheaters or economizers. Boiler blowdown is assumed to be 1500#/hr or about 1.1% as compared to power plant experience of 0.5% under similar operating conditions.

The same utility company referred to above operates a generating station with 675 psig-750°F boilers of in excess of 75,000#/hr rated capacity. The boiler maintenance cost is found to be about $0.006 per 1000# of net steam generated.

4. Water Treatment

The water treatment chemical costs are shown in Table I. Chemicals will be injected continuously by means of small motor-driven proportioning feed pumps.

5. Steam Plant Charges

A diagrammatic layout of the steam plant is shown in Fig. 7. It will be readily seen that the steam charges are difficult to evaluate because of the integrated steam system.

The basis for determining steam plant charges is shown in Table V. The total energy on a BTU-basis used for centrifugals and process (including oil pumps) was deducted from the gross boiler output. This difference was considered to be the net steam plant internal consumption. The ratio of net usable output to gross input was found to be 0.73 at 76% overall boiler efficiency. Thus, for each 1000 BTU of net usable energy, the gross input must be 1000/0.73 or 1370 BTU.

6. Auxiliaries and Utilities

In Table VI are tabulated the comparative utility and auxiliary requirements for the centrifugals and the reciprocators per 1000HP. The centrifugals are sub-divided as turbine and equivalent reciprocating horsepower. Inspection of this table will indicate that the centrifugal ERBHP utility and auxiliary requirements are greater in all cases except lubrication. This is because at the selected ratio of compression the gas-engine reciprocator is considerably more efficient thermodynamically than is the turbo-centrifugal plant. The relative efficiency varies with compression ratio, and at lower ratios and heavier gas, the centrifugal operates at increased thermodynamic efficiency. Reciprocator compressor cylinder efficiency may be as low as 85% depending upon compression ratio and selection.

Table III

Maintenance and Lubrication Cost of Turbo-Blower Units in Blast Furnace Service

Year	Turbine Horsepower Installed	Turbine Horsepower Operating	Maintenance Cost Labor	Maintenance Cost Materials	Maintenance Cost Total	Maintenance Cost $/BHP/Yr.	Lubricating Oil Cost Total	Lubricating Oil Cost $/BHP/Yr.
1926(½)	34,000	13,600	$ 1,505	$ 1,170	$ 2,675	$0.1966	$ 482	$0.0354
27	34,000	23,120	2,263	1,460	3,723	0.1610	189	0.0082
28	34,000	25,840	2,465	1,322	3,787	0.1466	195	0.0075
29	34,000	27,200	3,037	4,819	7,856	0.2888	302	0.0111
1930	34,000	21,760	2,245	9,957	12,202	0.5608	190	0.0087
31	34,000	16,320	2,357	709	3,066	0.1879	89	0.0054
32	34,000	13,600	801	926	1,727	0.1270	41	0.0030
33	34,000	11,560	1,495	3,733	5,228	0.4522	198	0.0171
34	34,000	15,640	1,323	2,281	3,604	0.2304	47	0.0030
1935	34,000	17,680	1,964	886	2,850	0.1612	119	0.0067
36	34,000	23,800	1,983	1,634	3,617	0.1520	101	0.0042
37	34,000	24,480	1,343	1,013	2,356	0.0962	67	0.0027
38	34,000	15,640	2,423	250	2,673	0.1709	139	0.0089
39	42,500	28,560	2,283	707	2,990	0.1047	36	0.0013
1940	42,500	33,300	2,540	8,864	11,404	0.3425	146	0.0044
41	42,500	37,400	3,046	3,141	6,187	0.1654	127	0.0034
42	42,500	38,100	4,314	3,358	7,672	0.2014	389	0.0102
43	51,000	44,200	4,914	8,100	13,014	0.2944	550	0.0124
1944(¾)	51,000	33,150	5,562	16,254	21,816	0.6581	452	0.0136
Total 18.25 Yr.	51,000	464,950	$47,863	$70,584	$118,447	$4.6981	$3,859	$0.1672
Average		25,477	$ 2,623	$ 3,867	$ 6,490	$0.2547	$ 211	$0.0083

Note: Does not include expense of condensers.

7. Operating Labor

In the boiler plant three boilers would have been installed for the process plant. The use of centrifugal compressors merely necessitated larger boilers, but did not actually increase the required manpower. Nevertheless, the centrifugals are charged on a pro rata primary steam consumption basis.

In the engine-generator building the operating labor has been prorated on the basis of required electrical horsepower.

In the compressor station proper, the centrifugals each occupy about the same floor space as one 1600HP reciprocator, although there are considerably less points of inspection and servicing in the case of the centrifugals. The compressor station labor was divided on the basis of occupied floor space—1/6 to the centrifugals and 5/6 to the reciprocators.

With all of the above factors considered let us endeavor to establish a monetary evaluation of the comparative operating and maintenance expense of the centrifugals and the reciprocators. In Table VII will be found this annual expense balance as evaluated for Seeligson for 1000 operating horsepower. The data are shown graphically in Fig. 8.

A study of these data indicates that the centrifugals do use more fuel and water, but are more economical in operating labor and maintenance. The fixed charges are a direct function of investment costs. The expenses exclusive of the fixed charges indicates $10,940/ERBHP as compared to $12,540/RBHP—a difference of $1,600/year, or about 12.8%, in favor of the centrifugal on a gross savings basis. However, expenses are deductible from federal income taxes. When proper credit is given, the net cash difference is $2,940/year, or about 17.4%, in favor of the centrifugal.

In summarizing our consideration of the operating cost of the centrifugals at Seeligson, it is indicated that the centrifugals will save the Seeligson Operators about $21,000 per year. This is equivalent to

Table IV

Normal Inspection and Emergency Shutdown Record

A. Normal Inspections

1. Turbines and all air-cooled blowers inspected once every two years.
2. All water-cooled blowers are inspected from two to three times a year.

B.. Emergency Shutdowns

No. 1 Blower—Pin worked out of governor lever losing volume control.
No. 3 Blower—Brass ring gear stripped.
No. 4 Blower—Plugged oil line causing bearings to run hot.
No. 4 Blower—Broken tool on oil pump gear causing governor failure.
No. 5 Blower—Oil line broken at oil relief valve.

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4. **MAXIMUM PENETRATION** of bullets into the formation, as proved repeatedly in competitive field tests.
5. **GUNS TO FIT EVERY CONDITION.** McCullough employs more than 30 different types and sizes of guns.
6. **ALL SIZES OF BULLETS** from $\frac{1}{16}$" dia. up to $\frac{3}{4}$" dia., to fit every possible need.
7. **BURRLESS BULLETS,** giving a completely burr-free hole, eliminating casing scraping, with *no* sacrifice of penetration.
8. **NO LOST TIME.** McCullough's simpler, lighter equipment cuts setting-up and moving-out time, speeds up every job.
9. **EXPERIENCED MEN.** With years of experience behind them, thoroughly-trained McCullough gun-perforating crews do their jobs quickly, efficiently, safely.

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Table V

Steam Plant Distribution and Charges

A. Total Boiler Output		
1. Primary Steam @ 600 psig and 825°F	196,644,370	BTU/hr
2. Boiler Blowdown @ 1%	685,500	"
3. Feed Water @ 287°F	(35,788,580)	"
Gross Output	161,541,290	"
B. Total Boiler Input @ 76% Efficiency*	212,554,000	BTU/hr.
C. Average Steam Distribution		
1. Centrifugals Direct @ 55,800 #/hr.	74,744,230	BTU/hr.
2. Process Direct	80,189,860	"
3. Boiler Plant and Losses	6,577,200	"
Total	161,541,290	"
D. Net Fuel For 1000# Primary Steam		
1. Direct Use @ Boiler Output	154,934,090	BTU/hr
2. Gross Boiler Input	212,554,000	"
3. Ratio Usable Output/Gross Input	0.73	

*—With air preheaters and economizers, boiler efficiency would be 83% and Item D-3 would be 0.79.

$315,000 net profit during the assumed 15-year depreciation period.

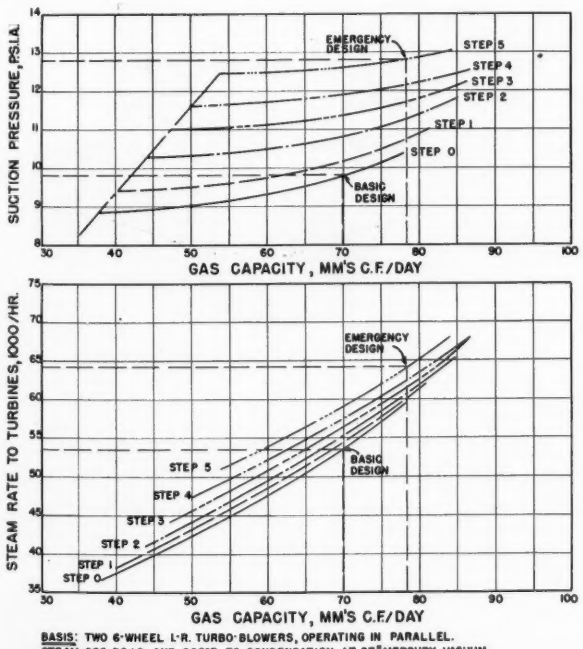
VIII. How Does the Centrifugal Compressor Fit Into Gasoline Plant Service?

We have developed the economic problem for those who must be concerned with that phase of the installation. Now let us turn to another very important consideration — the day-by-day plant performance of the centrifugals.

The first question which arises is how to apply instrumentation to make the centrifugals supercharge the reciprocators without the danger of interrupted station service and with a minimum of the operating personnel's time. The centrifugal is a constant-head machine at a given speed. The volume pumped at any speed is then primarily a function of the suction and discharge heads and the density of the gas being pumped. The centrifugal can pump a wide range of volumes at constant suction and discharge pressures by a small adjustment of the speed, and may be thought of as a veriable displacement machine. The reciprocator is a fixed displacement machine and the volume pumped at a given speed is primarily a function of the compressor cylinder capacity at suction pressure. For maximum utility of the installed reciprocating horsepower, it is imperative to maintain a maximum constant suction pressure consistent with the engine horsepower rating.

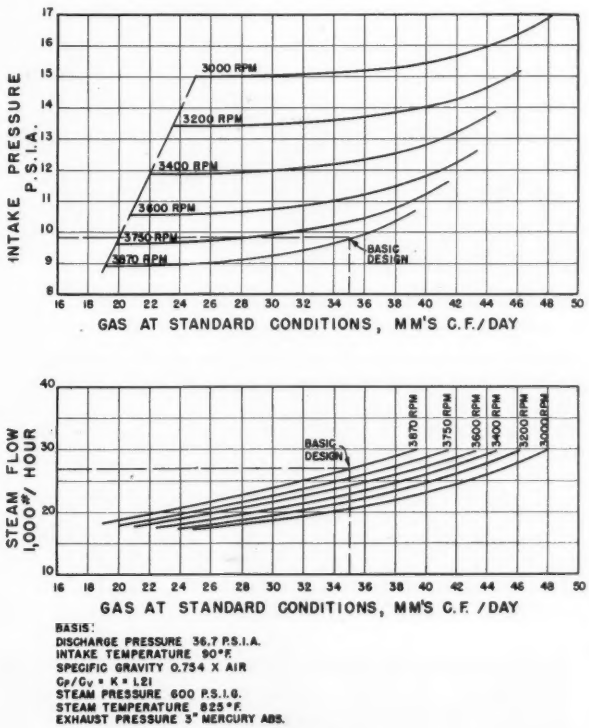
The instrumentation to be employed at Seeligson is shown in Fig. 9. The turbine is controlled to yield a constant pressure on the centrifugal discharge (reciprocator suction). The engine speed control will take its direction from the centrifugal suction, speeding the engine as the centrifugal suction pressure increases. The engine and turbine governors will each cut out at overspeed. In the case of underspeed on the engine, due to low throughput, the operator will take units off the line — putting them back as the load builds up. If the throughput increases to the point that the engine is running at full over speed (governor controlling) then the operator will open clearance pockets on the reciprocator and reset the two pressure controls. The centrifugal will automatically float on the line at minimum steam consumption between the set pressures within the wide limits of its capacity.

As mentioned above, to get maxi-



BASIS: TWO 6-WHEEL L-R. TURBO-BLOWERS, OPERATING IN PARALLEL. STEAM, 600 P.S.I.G. AND 825°F. TO CONDENSATION AT 27" MERCURY VACUUM. SPEED, 3870 R.P.M. DISCHARGE PRESSURE 4.0 P.S.I. ABOVE RECIPROCATOR SUCTION. STEPS CORRESPOND TO RECIPROCATOR UNLOADING.

FIGURE 11.
PERFORMANCE CURVES FOR CENTRIFUGALS SUPERCHARGING RECIPROCATORS AT VARIOUS UNLOADING STEPS



BASIS:
DISCHARGE PRESSURE 36.7 P.S.I.A.
INTAKE TEMPERATURE 90°F
SPECIFIC GRAVITY 0.754 X AIR
$C_p/C_v = K = 1.21$
STEAM PRESSURE 600 P.S.I.G.
STEAM TEMPERATURE 825°F.
EXHAUST PRESSURE 3" MERCURY ABS.

FIGURE 12.
PERFORMANCE CURVES FOR EACH INGERSOLL-RAND TURBO-BLOWER AT 36.7 P.S.I.A. DISCHARGE

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Spline-Type Clutch and Transmission provide easy, shock-free shifting.

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mum utility from the reciprocator installation in flush gas compression, it is imperative to provide a series of unloading steps (clearance pockets) to permit the suction pressure to increase as the reciprocator can pump the increased volume of gas at a reduced compression ratio. A very fine discussion of this problem will be found in a paper presented at the March, 1938, C.N.G.A. meeting (6).

At Seeligson the reciprocators have each been unloaded in five steps to yield full engine horsepower between the volumes of 7,000 and 7,850 MCF/Day/Unit at the suction pressures of 32.7 and 48.7 psia, respectively. The unloading curve presented in Fig. 10 is redrawn from that furnished the Seeligson Operators by Clark Bros. Inc. (6).

To correspond with these unloading steps Ingersoll-Rand has furnished a series of performance curves (7) for the centrifugals operating at the necessary constant discharge pressure to supply the reciprocator suction demands. Fig. 11 is a cross-plot of these centrifugal performance curves at the full speed rating of 3870 rpm.

At the basic design point of 10" Hg vacuum to 1000 psig and 70,000 MCF/Day, the centrifugal is discharging into the reciprocators at 32.7 psia (plus 4.0 psi interstage drop) The steam consumption is about 53,000#/hr. If the volume were to decline by 7,000 MCF/Day, one reciprocator could be taken off the line or the whole battery allowed to automatically slow down 10% in speed. The centrifugals would automatically slow down to maintain the fixed discharge pressure and the steam consumption would be reduced. If the volume increases above the 70,000MCF/Day the reciprocators will be overloaded unless clearance pockets are opened and suction pressure allowed to increase. At the overload the reciprocators and the centrifugals will both be operating at overspeed until the governors take control. With unloading and resetting the pressure controls, both types of machines will again be brought back into normal operating ranges. At the points marked "emergency design" the reciprocators have reached the limit of their unloading facilities and the station capacity is limited. The centrifugals can, however, continue to deliver more gas by suction pressure increase.

Table VI

Utility Distribution for Centrifugal and Reciprocating Compressors

	Centrifugals		Reciprocators
	1000 TBHP	1000 ERBHP	1000 RBHP
A. Cooling Tower Heat Load, BTU/Hr.			
1. Engine-Compressor Jacket	.....	.....	4,350,000
2. Generator Jackets	204,000	243,000	236,000
3. Compressor Oil Coolers	39,000	46,000	625,000
4. Generator Oil Coolers	25,000	30,000	29,000
5. Steam Condensers	7,360,000	8,762,000	.....
Total BTU/Hr.	7,628,000	9,081,000	5,240,000
B. Water Make-Up, Gal./Hr.			
1. Cooling Tower			
a. Water Evaporated	916	1,090	630
b. Blowdown, Losses @ 10%	92	110	63
Sub-Total	1,008	1,200	693
2. Boiler	25	30	.....
Total Required	1,033	1,230	693
C. Water Circulation, Gal./Hr.			
1. Cooling Tower Water @ 15° Rise	61,200	72,800	41,900
2. Jacket Water (Closed) @ 10° Rise	2,500	3,000	55,100
Total	63,700	75,800	97,000
D. Electric Power, BHP/Hr.			
1. Cooling Tower Water Circulation	22.0	26.2	15.2
2. Jacket Water Circulation	0.9	1.1	19.2
3. Cooling Tower Fans	16.0	19.0	10.9
4. Water Well Pumps	0.7	0.8	0.4
5. Lights	0.7	0.8	0.7
Total	40.3	47.9	46.4
Generator Input @ 75% Efficiency	53.7	63.8	61.9
E. Fuel, BTU/Hr.			
1. Boiler	14,134,000	16,826,000	.....
2. Gas Engine and Compresor	.....	.....	10,000,000
3. Gas Engine Generator	510,000	607,000	588,000
Total	14,644,000	17,433,000	10,588,000
F. Lubrication, Gal./Hr.			
1. Turbine and Compressor	15	18	.....
2. Gas Engine and Compressor	.....	.....	2,980
3. Gas Engine and Generators	45	54	52
Total	60	72	3,032

The foregoing discussion has indicated the manner in which the compressor station is loaded to its capacity. To fully appreciate the flexibility of the centrifugal compressor as compared to the reciprocating compressor, let us study the centrifugal performance at a fixed unloading step on the reciprocators. Fig. 12 shows the performance curves of one of the centrifugals at the basic design discharge pressure of 36.7 psia. To reach the design suction pressure of 9.8 psia (10" Hg vacuum) at design volume of 35,000 MCF/Day, the centrifugal will be running at its rated speed of 3870 rpm. Should the volume decrease, at constant suction, the centrifugal automatically shows its speed until it reaches the pumping limit at about 20,000 MCF/Day capacity. This is a variation from 100% to 57% of full station load, equivalent to taking seven reciprocators off the line in the station. If the load suddenly came back the centrifugal would automatically take the load until the overspeed governor cut out.

As another example, let us consider a different practical operating condition. We have had to make load factor allowances in our gathering system design to permit the plant to receive gas at 10" Hg vacuum under erratic flowing schedules. Let it be assumed that the flowing schedules have been leveled out to approach a 100% load factor. In this case the plant volume is still at 70,000 MCF/Day, but the plant intake pressure has automatically come to 11.0 psia. The reciprocator speed control must be reset to control at the 11.0 psia, but the centrifugal must still discharge at the 36.7 psia to keep the reciprocator suction constant. The centrifugal will automatcially slow itself to 3600 rpm as its new operating control point. The steam consumption will be reduced from 53,300#/hr. to 48,400#/hr. At this control point the centrifugal can pump between the limits of 21,500 MCF/Day to 39,500 MCF/Day at con-

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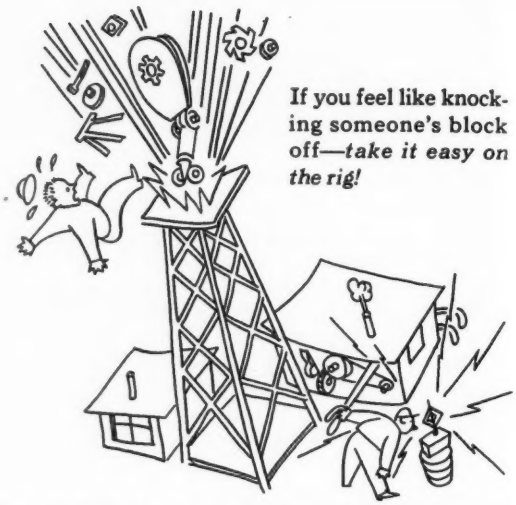

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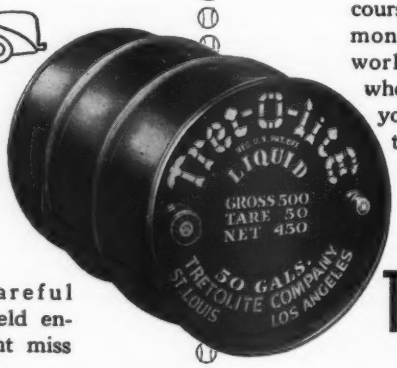

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stant suction and discharge pressures. This is a variation of from 61% of normal load to 113% of normal load. Above normal load, however, the reciprocators would have to be unloaded and the pressure controls reset to the new control point.

If reciprocators were performing under the above conditions, it would be good practice, if not necessary, to install a butterfly to maintain constant plant intake pressure. When the plant intake pressure increases with improved load factor, the butterfly induces a pressure drop to maintain the 9.8 psia setting. This condition would cause the reciprocators to pull at a greater operating horsepower than if the suction pressure could be allowed to increase. If the pressure increase is great enough to permit the opening of clearance pockets, then the butterfly could be reset for a higher pressure to conserve the operating horsepower, but the station flexibility has been decreased by one step of unloading. Because of these factors, which the centrifugal adjusts for automatically, the average comparative fuel load may be somewhat less than was charged in Table VII.

Many other combinations can be worked out. The foregoing discussion should serve as a thought provoker, and to show that the centrifugal is anything but inflexible.

Table VII

Annual Direct Expense Estimate for Centrifugal and Reciprocator Compressor Station

	Centrifugals		Reciprocators
	1000 TBHP	1000 ERBHP	1000 RBHP
A. Operating Labor			
1. Boiler Plant	$ 490	$ 580	$.....
2. Generators	340	400	390
3. Compressor Room	740	880	1,940
4. Supervision @ 5%	80	100	120
5. Benefits, Allowance, etc., 37%	610	730	910
Total	2,260	2,690	3,360
B. Maintenance and Repairs			
1. Turbo-Blowers @ 0.26/BTHP/Yr.	260	310	.....
2. Boiler Plant @ 0.010/1000# net	670	800	.....
3. Condensers, Gas Coolers @ 0.0015/sq. ft./Yr.	30	30	20
4. Generators @ $2.50/BHP/Yr.	130	160	150
5. Reciprocators @ $3.00/BHP/Yr.	.....	.....	3,000
6. Pumps, Cooling Tower, Etc. @ ½%/Yr.	290	340	260
Total	1,380	1,640	3,430
C. Fuel @ $0.042/MMBTU	5,390	6,410	3,900
D. Lubrication @ $0.60/Gallon	40	40	1,820
E. Water Treatment			
1. Boiler Make-Up @ $0.0009/1000#	20	30	.....
2. Boiler Feed @ $0.0117/1000#	60	70	.....
3. Cooling Tower Make-Up @ $0.0055/1000 gal.	50	60	30
Total	130	160	30
F. Fixed Charges			
1. Depreciation @ 6%	6,920	8,240	10,440
2. Ad Valorem Taxes, Insurance, Etc. @ 3%	3,460	4,120	5,220
Total	10,380	12,360	15,660
G. Grand Total	19,580	23,300	28,200
H. Net Cash After Income Tax			
1. Expense	19,580	23,300	28,200
2. Income Tax Credit @ 40%	(7,830)	(9,320)	(11,280)
3. Net Cash	11,750	13,980	16,920

IX. Conclusion

The conclusions which are drawn from the specific case of the centrifugal compressor installation at Seeligson are:

1. The investment cost for the centrifugals will be approximately 21% less than for the reciprocators. Although the comparison is not for identical compression ratios, it is believed that the reciprocators were not penalized.

2. The centrifugals will cost 17% less in terms of annual net cash expenses for operation and maintenance.

3. The centrifugals used more fuel and auxiliary utilities than would an equivalent reciprocator installation. The relative value would change with compression ratio and specific reciprocator cylinder efficiency.

4. The turbine-driven centrifugals are quite flexible, particularly in flush gas compression service where volumes and pressures are not stabilized.

5. No generalization should be made from this comparison. Each specific installation must be evaluated to determine the optimum machinery type and size.

Acknowledgments

The author wishes to gratefully acknowledge the assistance of the many people who have contributed toward the compilation of this paper. Individual acknowledgments are due particularly to the following:

1. Magnolia Petroleum Company and the individual companies referred to as the Seeligson Operators for their permission to present the economic data contained in the paper.

2. The engineers of the Seeligson Plant Committee who by their vision and fortitude made the Seeligson centrifugal installation possible.

3. The refining and steel companies for permitting the inspection of their centrifugal compressor equipment.

4. The centrifugal compressor sales engineers who through their sales visits and proposals have contributed much to the author's scanty knowledge of centrifugals.

5. Mr. J. C. Vandaveer for the drafting of the figures presented in the paper.

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The author has left out figures 1-2.
Editor.

October Meeting

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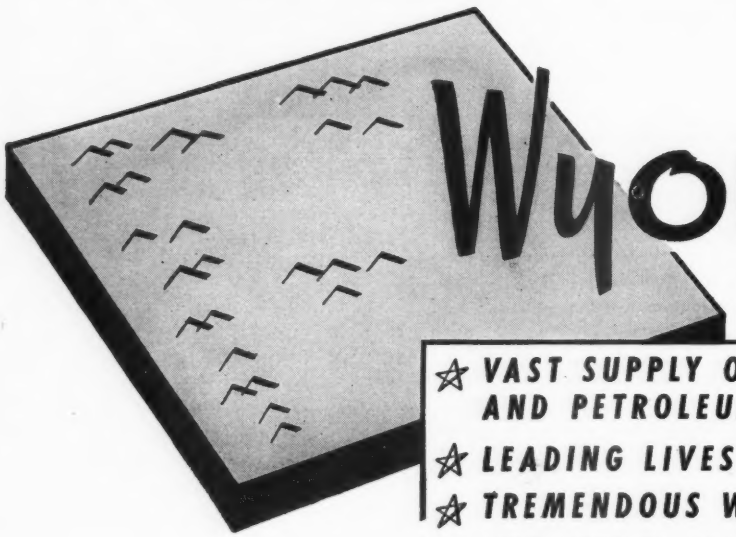

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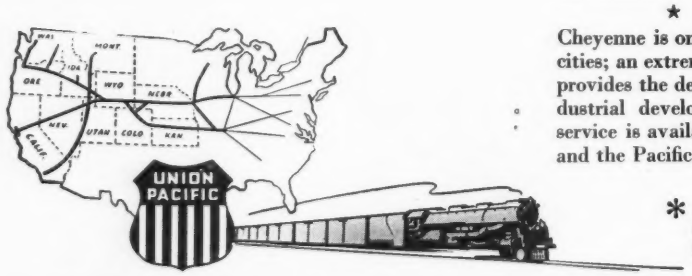

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THE STRATEGIC MIDDLE ROUTE

Some Experimental Tests With Hydraulic Pressure Applied to Cement Plugs in Oil Well Casing

By
Waldo Moore,
Partner and California Manager,
THE CAVINS CO.

The Author

Cement plugs are placed in oil well casing for several reasons, among which may be the isolating of one zone from another either permanently or temporarily, plugging back for testing, shutting off water, or closing off a damaged section of the well. The outlay for labor and material and the time required for placing the plug are comparatively small. If at any time it is desired to remove the plug it may be easily drilled up with relatively simple equipment and a minimum of time and labor. It does not require the use of rotary equipment for its destruction or fishing tools for the removal of the remnants. In some cases the loss of time involved in waiting for the cement to set up may rule against the choice of the cement plug. This will vary from 6 to 48 hours, depending upon the particular job to be done, the choice of materials, and the whim of the operator.

Most cement plugs are made in the well by using a light weight aluminum-bodied bridging plug with canvas seal rings to prevent the cement from traveling down through the well fluid, and an **off-bottom dump** with full opening throat which unloads when the tool is started up the hole. This dump bottom is used as a setting tool for the drillable bridging plug and is attached to the lower end of one or more sections of pipe, usually a stand of tubing, which carries the load of cement and is run in on a sand line. It permits continuous dumping of cement with no loss of time as is required of dumps which must be set down on a solid bottom to unload. When cement is to be dumped with a **regular conventional bottom-opening** dump, which will fill up the casing in excess of 10′ or thereabouts per trip, a time loss develops because of the necessity of having to wait for previous loads to set up sufficiently to give a solid footing on which to open the dump. For safety's sake it is not advisable to run any dump repeatedly into cement which is setting up.

The **off-bottom dump** was used on one abandonment job, with a three-man crew, to dump 205 sacks in a continuous operation to fill up in the neighborhood of 1750′ in 5¾″ O.D. perforated casing. This type of dump with full opening throat is also used to spot chemical or place plastic material successfully, as the load is discharged in a solid slug out the bottom and is not jetted or squirted into the well fluid. Sand and gravel are also easily dumped with the same equipment. Experience has shown that the best results may be had if these last two materials are lubricated with sump oil or rotary mud to let them slide out of the bailer tubes easily.

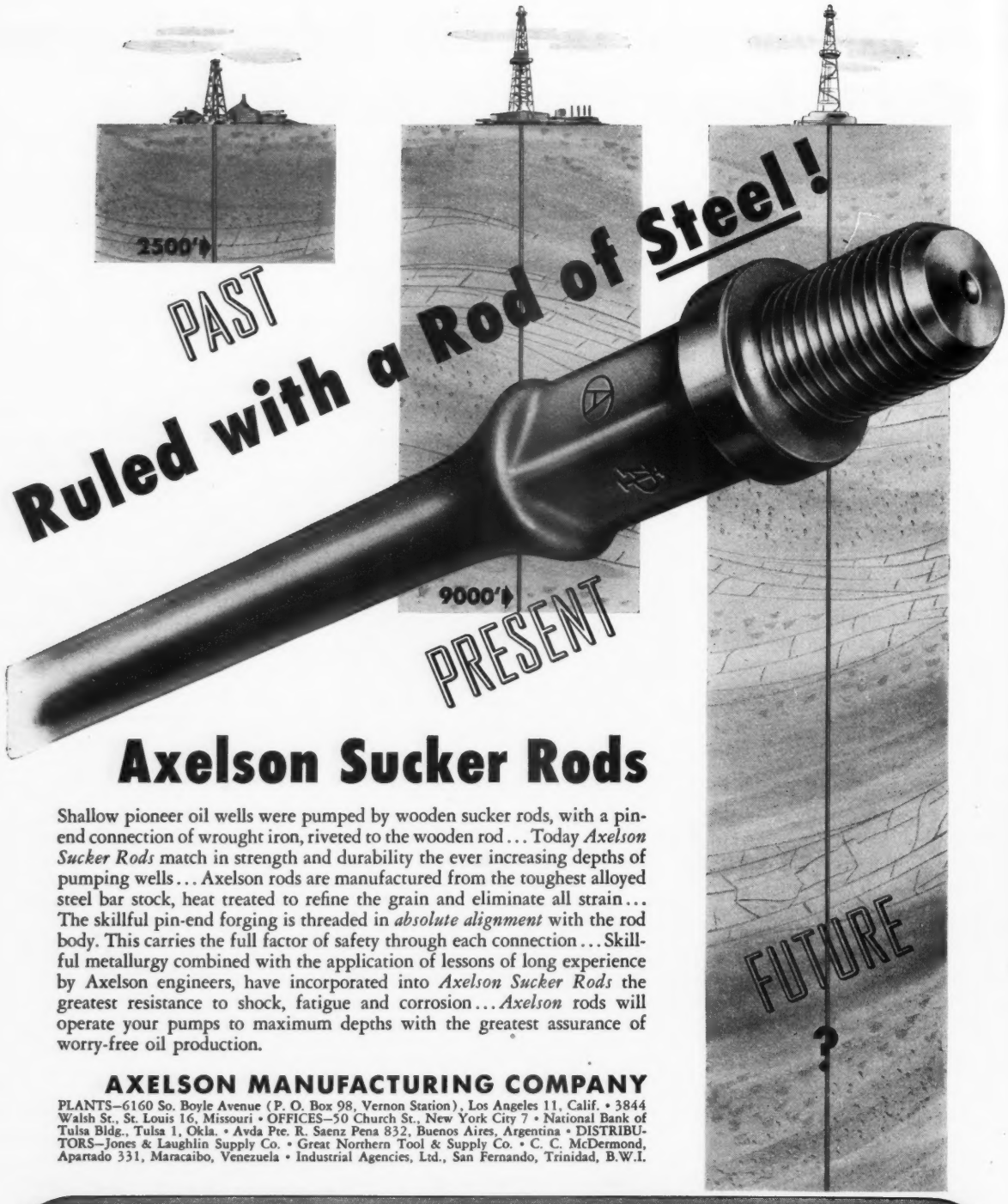
The several advantages of the cement plug regarding both installation and removal are well acknowledged however, but little information was available on the size of the load or the amount of pressure that such a plug could be expected to carry without movement or leakage. To determine roughly what this is, a series of shop tests were made. A discussion of the procedure and the results and a table of the findings follow.

Short sections of used oil well casing, selected at random and with no attention being given to weights other than to determine that they were within popular weight ranges, were stood on end and filled in varying amounts with a neat mixture of regular construction cement which was mixed to weigh 123# per cubic foot for all tests.

After the cement had set up in the casing, high pressure connections were attached to the open, or unfilled end. Connections were made to a motor driven high pressure hydraulic tubing testing unit and fluid introduced into the unfilled chamber of the casing section, a vent valve in the upper end of which was left open until all air in the unfilled space of the casing section had been exhausted. This vent valve was then closed and the specimen to be tested was laid down horizontally so that any movement of the plug could be observed as the pressure was being applied.

The amount of pressure required to move the cement plug in the 4¾″, 5½″, and 6⅝″ O.D. sizes seems to have increased with the length of the plug in a reasonably satisfactory degree. The pressure applied to the plugs in the 8⅝″ O.D. size was in two cases not consistent with what might be desired. The cause of this has not been definitely determined but it may be assumed that the smooth interior surface of the pipe in these two instances was a major contributing factor. All samples of the cement plugs were broken apart and examined after the tests were completed and found to be uniform.

Insofar as the cement gripping the inside of the casing sections is con-



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DEEP WELL PLUNGER PUMPS AND SUCKER RODS

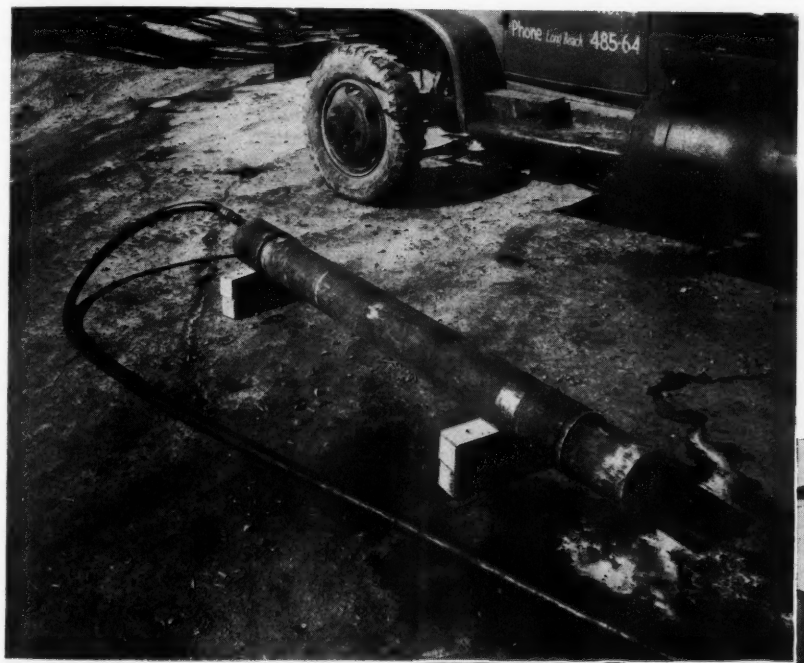
THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

cerned the test conditions may be considered as having been ideal for the pipe was dry and no attempts were made to wet the pipe surface with oil or mud such as would be the case in most installations. On the other hand the test plugs did not have the benefit of the support of a fluid column on the underneath, or resistance side, which would likewise be the condition in most installations.

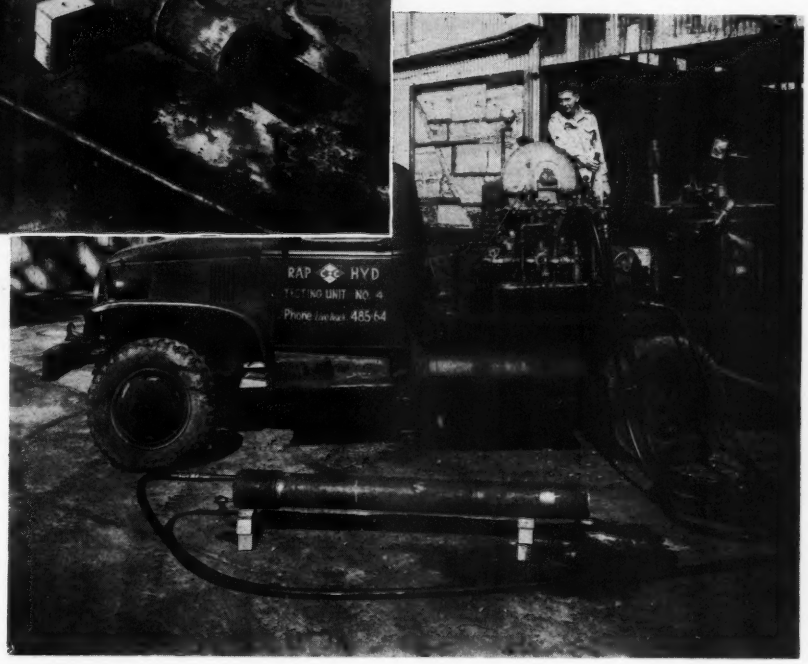
It may be of interest here to mention one recent plug installation in a well from which the owner wished to salvage some pipe. This well had practically no fluid in it and surrounding wells were pulling a vacuum on it. The plug had to be set a considerable distance above the fluid level, withstand the vacuum and be of a type that could be removed with the minimum of trouble. The procedure was to set the drillable bridging plug in place with the **off-bottom dump** and then spot about 2′ of sand and then 2′ of cement on top of the bridging plug. The plug stayed in place and effectively shut off the vacuum. The next morning the casing was cut and pulled and the old drilling mud from between casing strings was bailed off the top of the plug. A plain bailer with chisel shoe was

(Continued on Page 64)

O.D. Pipe	Length of Plug	Setting Time	P.S.I. Required To Move Plug
4¾″ Blank	1 Ft.	48 Hrs.	1000
4¾″ Blank	2 Ft.	48 Hrs.	1900
4¾″ Blank	3 Ft.	48 Hrs.	2500
4¾″ Blank	4 Ft.	48 Hrs.	4000
5½″ Blank	1 Ft.	48 Hrs.	1500
5½″ Blank	2 Ft.	48 Hrs.	2600
5½″ Blank	3½ Ft.	48 Hrs.	3200
5½″ Blank	5½ Ft.	48 Hrs.	4000
6⅝″ Blank	1 Ft.	48 Hrs.	500
6⅝″ Blank	2 Ft.	48 Hrs.	1000
6⅝″ Blank	3 Ft.	48 Hrs.	1300
6⅝″ Blank	4 Ft.	48 Hrs.	1700
8⅝″ Blank	2 Ft.	120 Hrs.	500
8⅝″ Blank	2 Ft.	96 Hrs.	1200
8⅝″ Blank	3 Ft.	120 Hrs.	900
8⅝″ w/collar recess	2 Ft.	144 Hrs.	2000
8⅝″ w/collar recess	3 Ft.	144 Hrs. (See Notes)	3000



Test section of casing showing cement plug being forced out under hydraulic pressure.



High pressure hydraulic unit used for testing oil well tubing shown here connected to a test section of casing before applying pressure to cement plug.

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Cycling at High Pressure Vs. Depletion and Cycling at Low Pressures

By E. O. Bennett
Houston, Texas

There has always been a question in the minds of producers and operators whether to operate an oil field or condensate recovery project under pressure maintenance at its initial pressure or to produce the field to partial depletion and then commence an injection program.

Cycling, as used by the industry, is a rather broad term and applies to both oil fields and gas condensate type fields. The condensate recovery from single phase reservoirs and the return of denuded gas is ordinarily termed "cycling". The production of oil and the return of included and accompanying gas is ordinarily termed "pressure maintenance." In principle, the operations are the same as reservoir fluids are produced, part of which are taken out, part burned as fuel, and the remainder returned to maintain reservoir pressure.

Before undertaking a discussion of when to start gas return, especially in condensate recovery operations, it appears advisable to enumerate the controlling factors involved in a field problem, whether it be in connection with gas return for pressure maintenance purposes in an oil producing property, or for the prevention of pressure decline in connection with a cycling project, for the recovery of hydrocarbon condensate.

The predominating consideration which controls is the one which will permit the greatest return to be made with the least capital invested, when operating under permissible rules of existing regulatory bodies or statutes.

It may be, and often is possible, to increase the ultimate recovery in barrels without regard to the cost of obtaining such recovery. Any such method is not one that will comply with the above condition and should not be adopted.

One problem that always bothers the producer or operator is that the price received for products has much to do with the method used for their recovery. A method of operation, or production, which will return the greatest earning with oil or condensate at one price may not do so at a different price. All present here have seen the price of oil vary from $0.10 to $3.50 per barrel, which is quite a range.

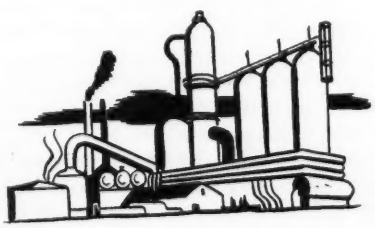
Although we do not anticipate any such variation of price range in the future, it can be readily seen that the best method of operating any pool or field would be to design for conditions at hand with as wide a range of flexibility as possible.

Methods of operation which always come up for discussion, in a new development, are pressure maintenance and cycling, by the return of produced, or produced and extraneous gas to the reservoir from which liquid hydrocarbons are recovered.

Pressure maintenance should, at no time, be looked upon as a "cure-all" for many of our producing ailments, and should only be considered where the profit made by its use is greater than can be realized by other methods of operation.

The general reasons for adoption of pressure maintenance operations are now well understood by the producing industry generally. Such operations are important to the natural gasoline phase of production, and since you gentlemen are primarily engaged in this part of the oil business, I will briefly enumerate them once more as they are also important in cycling operations:

1. To retain sufficient energy in the reservoir to move oil to a well bore, from where it may be moved to the surface.
2. To maintain pressure to prevent gas originally dissolved in the oil from escaping thereby increasing the viscosity of the oil and necessitating more energy to move a unit quantity through the reservoir.
3. To prevent edge or bottom water encroachment from moving the oil volume upwards into an otherwise oil free gas cap, thereby reducing the amount of oil that may be recovered.
4. To permit oil to be produced at maximum rates, whereby the rate of return on capital investment will be increased and labor costs reduced.
5. To save a sometimes wasted supply of gas for subsequent use.
6. If pressure is not maintained oil left in a reservoir will be "tank" oil. If pressure is maintained oil left in the reservoir will have gas in solution and its "tank" oil content will be much less than that left by pressure decline production. Due to this fact alone, millions of barrels will be produced from large reservoirs by pressure maintenance that would otherwise be lost. This will also be the effect in an oil ring in connection with condensate recovery from a gas cap with oil at its flank edge.



It should next be pointed out that there are two types of subsurface reservoirs containing condensible hydrocarbons in the vapor phase. They are:

1. A single phase gas reservoir where all liquefiable hydrocarbons are in the vapor state and no oil ring or column is present.
2. A gas cap reservoir containing a supply of gas and liquefiable hydrocarbons in a vapor state where such gas cap exists in connection with an oil ring or column.

Either or both of the above types of reservoir may be and generally are accompanied by bottom or edge water or both.

Type of Field Should be Determined

As soon after discovery as possible, the size, and nature of a new pool should be determined, in order to evaluate the gas and oil volumetrically to ascertain their relative values and the method of operation for maximum ultimate economic recovery on capital invested.

Two Phase Reservoir

If a two phase reservoir is discovered, it is obvious that any method which will increase the recovery of liquefiable hydrocarbons from the gas cap, by causing a loss in recovery from the liquid phase, is wasteful and should not be conducted. Pressure decline methods of operation prior to cycling can and will cause serious losses where sizable oil volumes exist. This means that in a field or pool where such conditions exist in connection with a gas cap condensate section pressure maintenance operations under high pressure cycling are mandatory, and until such time that the economic limit of oil production is reached there is no choice in the matter of operation.

This then brings our subject down to a singe phase reservoir.

Single Phase Reservoir

Recently the methods of operating a single phase condensate pool have received much attention in an attempt to determine how to obtain the greatest economic yield.

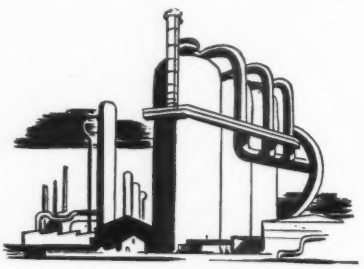
In order to properly discuss this subject it is assumed that there is a market demand for all available gas and it needs not to be returned to the producing formation to save the gas itself. This is especially true in your part of the country where we are sending you a lot of BTU's through the "Biggest Inch" line from our supply back in Texas.

Laboratory Work

A very interesting, valuable and enlightening discussion and analysis of the best method of operating a single phase reservoir was undertaken here on the coast by Standing, Linbad and Parsons, and presented before the A.I.M.E. earlier this year.

Conclusions reached from this excellent laboratory study were "The recovery of the heavier components from a gas cap or retrograde pool under various production methods has been calculated. The results show that the recovery is greatest if the reservoir pressure is allowed to decline prior to cycling dry gas" (1).

It will also be assumed that the proper type of unitization will be carried out as no condensate recovery project can be properly conducted in the absence of unitization. Concerning unitization—it is extremely difficult to understand the reluctance to unitization shown by some operators, and I believe you have your share of such trouble out here. No case is yet known where all participants have not benefited by unitized operations. This will



also apply to two phase reservoirs and no valid objections to unitization can be proposed, although many excuses are offered in each one that comes along. With a proper spirit of "give and take", and fairness among and between operators, there is no reason why unitization cannot be made to work any place and under any conditions. Results from unit operations speak for themselves.

If a pool is to produce by pressure decline methods, liquids will condense out of the vapor when the critical pressure is reached. Such liquid will remain in the formation unless again vaporized and carried out by re-cycled dry gas. The reservoir temperature is assumed to remain constant under pressure decline operations.

Under pressure decline operation only a minimum number of producing wells are required as no consideration of sweep pattern efficiency is involved. All gas will find its way to the wells used because of pressure differentials created. The laboratory work leading to the conclusion above stated indicates that the greatest recovery will be obtained by cycling three times the gas at low pressure. It is not believed that sufficient correlation exists between laboratory work and field practice to apply such conclusion directly. Some of the disturbing factors are pointed out below.

If the pressure in a reservoir was originally 4000 p.s.i.a., as indicated for maximum recovery before cycling, approximately 90% of the original gas would have been produced, assuming no water drive exists, and that the gas follows Boyle's Law. Neither of which are quite true but will suffice for this discussion.

The number of wells required or permitted may be limited by the rules and regulations of regulatory commissions, or by physical capacity of a well to produce.

The number of wells required to produce a volume under the above conditions will be much smaller than the number required to effect an efficient sweep pattern at the lower pressures. For an efficient sweep pattern a large number of wells would have to be drilled. To reduce the pressure, as above cited, in a large reservoir might require 10, 15 or 20 years. The drilling of many new wells in a field at this time with only 10% of the original gas in place in order to effect an efficient gas sweep, would hardly meet with management's approval, especially where the cost could run into a million or more dollars. If a field was produced under pressure decline and management would not then drill the wells required, the field so operated would show much less recovery than one where cycling was involved at high pressure.

The experiments showed that for the test conditions 100% of the residual condensate could be vaporized after the gas had passed through the sand three times at pressures well below the retrograde point. Under actual field conditions it would be necessary to pass more than three volumes through the sand because of irregular advances through the sand body, and because of the nature of the sweep pattern. (2). It must be remembered that 100% vaporization can also be effected by recycling the stripped gas at pressures above the retrograde point at fewer than three volumes. In either the retrograde or normal region of pressures, recycling of stripped gas would cease when the produced gas became so lean that it could not profitably be

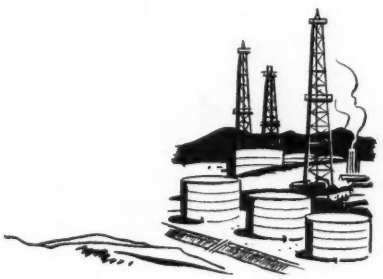
produced and reinjected. In high pressure operations as now actually practiced, cycling continues until the economic limit of recovery is reached. In practice the relative efficiency in recovery of liquefiable products in the gas would depend upon the relative costs per MCF and other economic and practical considerations.

Economic and practical conditions vary quite widely in gas condensate reservoirs, particularly with respect to the market for residual gas. Where there is no satisfactory market for the residue gas, economics will usually cause cycling at original pressures until a market can be developed. Where there is a satisfactory market for the residue, the deferment from the sale of residue gas must be balanced against higher and quicker recovery of condensate and the possible appreciation in gas prices while it is being withheld from the market. From the profit standpoint it is usually not profitable to build and operate a cycling plant when a satisfactory residue market exists, except for rich gas of at least 50 barrels per million feet. Many gas reserves have oil rings which may be the compelling reason for withholding from an available market until the recoverable oil has been produced. Under such conditions it is likely to be profitable to cycle the gas cap to obtain income from the gas liquid contents, while recovering the oil. If such a pool is not unitized, the matter of correlative rights can offer serious handicaps to both the oil and gas cap operator.

From the standpoint of pure conservation, cycling is not justified except on the richer gases. The savings in liquid products must offset the greater field consumption of gas in a cycling plant and the breakeven point has been found to be at about 50 barrels of liquid recovery per million feet of gas. The loss of gas for fuel becomes a more predominant factor for recycling at lower pressures. Practically, conservation cannot be separated from economics as conservation cannot be enforced where it creates an undue economic loss to property owners.

The total recovery by pressure maintenance or cycling at high pressure and that which may be recovered by pressure decline from initial pressure to a low pressure and then using a gas sweep should recognize all factors to make a proper comparison.

It is believed that the comparison should be by comparing the total liquids recoverable down to abandonment of the project in each case. In the high pressure cycling part of the liquids will be recovered while the pressure is maintained and an additional quantity will be obtained during the period that the field is having its pressure depleted by the sale of the residual gas (after cycling at high pressure, down to the abandonment pressure. The volume of liquid which will remain



after the high pressure cycling was shown by the experiments to be 29%; 58% of which would be recoverable during the depletion by sale of gas. The sum of the two values is 87.83%, which is greater than the 87% shown by the experiments for early pressure depletion and gas sweep.

The amount of liquid recovery that will actually be obtained from the time cycling is stopped under high pressure program down to project abandonment period will be governed to a large extent by the content of the gas and the type of plant doing the processing. When the cost of processing is greater than the recovery value the extraction will cease in both methods of operation.

With credit to the high pressure operation of the economically recoverable quantity of liquids to abandonment for comparison of the total quantity of liquids economically recoverable by the decline and sweep method there appears to be no choice. When drilling costs and time factors are applied it then appears that the high pressure operation shows far greater recovery and is the system which should be used.

It is appreciated that a single specific example is not sufficiently broad enough in its application to justify any final conclusion, as the type of reservoir material can and does vary over extreme ranges between fields, and this fact alone will make some difference in conclusions reached.

Conservation and correlative rights do not always go together and some interpretations of conservation can cause confiscation. The following examples are given to show the practicality of cycling at high pressure versus depletion and cycling at low pressure.

A reservoir containing 100,000,000 MCF of gas at 3000 p.s.i.a. pressure has five wells averaging 30,000 MCF daily potential is assumed. One well is to be used as an injection well and four are to be used as producers. The sweep pattern efficiency is assumed 80% of the wet gas volume.

If cycling were applied to such a field, under original pressure conditions the average producing pressure during the cycling period would be about 2750 p.s.i.a., and the average potential 26,000 MCF. Assuming permissible production of 20% of the potential the production per well would be 5200 MCF and the field production 20,800 MCF daily. Allowing for a total dilution of the wet gas by dry gas in the amount of 20%, the reservoir would be cycled out in 13 years, after which gas sales would begin and be carried out continuously until the abandonment of the reservoir. During this production most of the remaining wet gas would be processed.

Next, assume the same reservoir had been depleted so that the pressure had dropped to 1000 p.s.i.a. before cycling was commenced. The gas reserve would then be 33,300,000 MCF. During cycling starting at this pressure the average producing pressure would be about 800 p.s.i.a. and the average potential 3,200 MCF. 20% of this potential will be 640 MCF per well or 2540 MCF for the field. At 80% producing efficiency in sweep pattern it would take 28½ years to pass one volume of gas through the reservoir sand and 85½ years to pass the gas

through three times. Allowing for irregularities in the sand body, it would take even more time.

Now, assuming the pressure be permitted to drop to 500 p.s.i.a. before cycling is started, the reserves in the reservoir would then be about 16,700,000 MCF and the average production pressure about 350 p.s.i.a. The well potentials would be about 1100 MCF and at 20% of this capacity the well production would be 220 MCF and for the field 880 MCF. It would take 41½ years to pass the gas through once and 124½ years to pass it through three times, assuming field efficiency equal to laboratory efficiency.

From the above it can be seen that if the decline method down to 400 or 500 pounds were used and then cycling commenced, that many more wells would be required to produce the field out in the same time as could be done under high pressure cycling. The first case presented above would require 85/13 or 6½ times as many producing wells as originally existed, or 22 new wells. If the field was 10,000 feet deep the wells would cost $100,000 or more each, and a new investment of $2,200,000 would be required. If the liquid content initially averaged 60 barrels per million feet and, as the laboratory experiments indicated, 16% more liquid recovery could be realized by the decline and sweep method then the reservoir we have assumed would contain six million barrels of recoverable liquids and the gain of 16% would have been 960,000 barrels. At an assumed price of $2.15 per barrel or a net price of $1.95, the gain would be worth $1,870,000 and its cost $2,200,000, indicating that the operation would not be justified.

If the additional wells were not drilled the time required to earn the income from the 16% increased recovery would be more than offset by the discount factors which must be applied against the deferred income.

If we go to the 500 pound pressure it can be seen at a glance that the number of wells required to deplete the field under any reasonable period of time becomes prohibitive and cannot be considered at all because of the state of depletion of the reservoir.

From these cases it can be readily seen that high pressure cycling without depletion and gas sweep is more economical and that the increased recovery which might be made by decline in pressure and gas sweep methods will cost more than its market value, and is not in the realm of economical range of recovery.

To cycle at low pressures the cycling plant would be smaller and less costly, but the expense of producing, processing and reinjecting

the gas would be considerably more per MCF, hence it could not be produced to as low a content as under high pressure cycling.

The gas content at 1000 p.s.i.a. would be much less than the original, and at 500 p.s.i.a it would be nearly as rich as at the original conditions. At lower pressures it would become even richer, as has been shown by Lewis (3). To start cycling then would be to prevent the gas from becoming richer, whereas cycling in the early stage of operations would prevent the gas from becoming leaner. The ultimate quantity of liquids will, however, be theoretically increased by low pressure cycling, but such theoretical increase cannot, in the light of present practice, be done except at a loss.

During the time the field pressure might be depleted under pressure decline methods, gas sales would in all probability take place and gasoline and pipe line facilities installed, markets established and sales contracts made. When the lower pressure was reached the operator would be confronted with the alternative of taking his residue gas off the market, installing an injection plant and the drilling of more wells or withholding his gas, not for 13 years in the case of high pressure injection, but for many times the 13 years. It is not hard to visualize most operators deciding against cycling at this stage under such conditions, or if they did go ahead, they could not be expected to operate cycling long enough to approach the completeness of revaporization, indicated by the laboratory experiments, and needed to increase the recovery.

The above example of a field case assumed a sand body of moderate thickness and permeability. If instead of the potentials used, the well potentials were three times as large, cycling at all three pressures discussed could be conducted in one third of the time stated. In fields where wells have high permissible allowables the disadvantage of delayed cycling would not be as great as with smaller wells, but economic considerations would cause cycling to cease when the content of the gas became worth less than the operating expense, and there would still be the disinclination of the operator from severing his gas markets and current income.

Since reservoirs which are initially under retrograde pressures are always deep, they cannot be profitably produced to very low pressures, except where the sands are very permeable and quite thick, and where the price of gas is high. In some deep fields, the prospects are that it will become uneconomic to produce them much below 500 p.s.i.a.

An intensive study of the effect of reservoir temperature on retrograde loss indicates that as the reservoir temperature increases there is a decrease in the loss resulting from retrograde condensation (3). From this it may be anticipated that the retrograde losses from deep reservoirs will be less than for the shallower ones.

Under the above conditions, aside from the economical considerations previously discussed, the use of revaporative sweep along with pressure decline will become less effective with regards to total recovery as deeper development is encount-

ered, and since all indications point to condensate recovery in many real deep pools, the pressure decline and gas sweep method appears to have but little value for future operations.

In the laboratory work where it was indicated that the pressure decline and gas sweep method of operation would show the highest recovery one important variable was not present. It was the permeability of the producing section which has so much to do with the sweep pattern efficiency in a field operation.

Sweep Pattern Efficiency

If wells are properly spaced and injection rates controlled it is possible to have a high sweep pattern efficiency under pressure maintenance or early cycling.

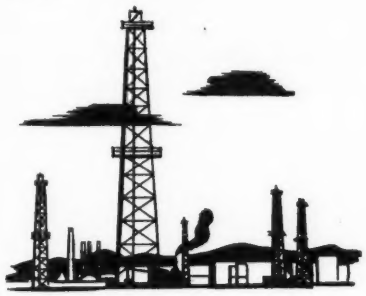
Permeability does not follow regular and stratified patterns and flow in an actual operation is not always lateral. Diagonal flow often exists. Many hundreds of core samples have been recently analyzed in a large new cycling program in North Louisiana and the permeability followed no regular pattern.

If lenticular islands exist in a large sand body, and tests indicate this to exist, it can be seen that as long as pressure is maintained above the retrograde point the gas in these "islands" can move to the producing wells. If, on the other hand, the pressure is reduced below the retrograde, the liquid condensing in the island area occupies a much larger percentage of the total hydrocarbon pore space than in the more permeable zones and an effective block to any material flow is caused, which will result in the bypassing around these "islands" during the gas sweep in the pressure depletion operation. This will reduce the recovery and it is not believed that the laboratory conditions can be reached or even closely approached.

Liquid Content and Depth

Experience indicates that reservoirs less than 4000 feet deep show no important retrograde characteristics and that the capacity of wells to produce generally increase with depth. The liquid volume is generally greater in the deeper wells.

As the condensate wells go deeper the problems of operating them at 400 p.s.i.a. or less become very critical, and a safe limit for production operations alone will prevent getting down to the suggested pressures.



Content and Composition

Since the capacity of a gas to carry liquid in vapor form depends upon the total composition and distribution of such composition, it can be seen that there can be wide variation of the content of condensible hydrocarbons in gas that exists at the same temperature and pressure. Olds, Sage and Lacey (4) have shown how the capacity to hold the less volatile hydrocarbons in the vapor phase can be reduced by removal of propanes and butanes from the gas.

Large differences in liquid content have been found in a single reservoir in the Stratton-Agua Dulce area of South Texas. Any appreciable change in this value cannot be shown in laboratory experiments.

Effect of Pressure Decline Production on Gasoline Plant Operation

A gasoline plant can only be installed when:

1. There is a sufficient volume of gas for processing that capital invested, plus a reasonable earning can be made during the life of the project. More efficiency in recovery can be maintained with high pressure absorption. Under cycling and pressure maintenance the pressure will remain in a narrow band at a high level, and a high pressure plant may be installed. Under pressure decline procedure a plant to take care of excessive conditions will operate with lower efficiency during the latter life of the project.

The horsepower required for returning gas under high pressure cycling will be less than under pressure decline and low pressure cycling as larger volumes of dry low pressure gas will be required for the so called "evaporated sweep". The content of much of the gas under pressure decline and evaporative sweep will be too low for economical processing and because of the volume required and the time required, the labor costs may be prohibitive. The time required to deplete the life of a condensate field would be far in excess of that generally considered available for equipment in a gasoline recovery plant.

Conclusions

1. Laboratory experimental work, while theoretically correct for the equipment used, does not adequately correlate test equipment with full scale operations in a cycling program, and conclusions reached by such work must be considered with extreme caution before being applied to actual production practice. All factors must be given consideration before proper comparison can be made.

2. Theoretical differences in recovery of a high pressure cycling system versus pressure depletion and low pressure cycling do not show sufficient increase to offset the unknown and variable factors, to assure that pressure depletion and evaporation sweep will show any increased recovery. Where economics and time factors are used the reverse appears to be the result.

3. If suitable gas markets are available, a study should be made to determine whether or not the starting of a condensate recovery project will be economical where the reservoir gas contains under 50 barrels per million feet of gas.

4. In the absence of a gas market at a reasonable price, cycling may be used in a field where the barrels of recovery are less than 50 per million feet, in order to provide current income. Such an operation may not be the most economical if a market is later obtained but does permit current income prior to market availability.

5. A study of several existing cycling projects indicates that high pressure cycling is more economical than pressure depletion and gas sweep would have been for the

(Continued on Page 64)

Petroleum Men Meet In Joint Fall Meeting

The Annual Joint Fall Meeting of the Pacific Section of the American Association of Petroleum Geologists, the Society of Economic Paleontologists and Mineralogists, and the Society of Exploration Geophysists, will be held at the Huntington Hotel, Pasadena, on November 6 and 7, 1947. The meeting will be attended by geologists, paleontologists, geophysists and engineers to hear the presentation of papers on a wide variety of geological problems related to the ever increasing search for additional petroleum reserves.

On Thursday morning, November 6, 1947, the A.A.P.G. meeting will open with an all day symposium on "Accumulation of Oil in Fractured Rocks", a topic which should be of interest to all coast geologists.

The S.E.G. has scheduled a symposium for Thursday morning, November 6, 1947, on "Correlations in California" and during the afternoon a series of papers of general interest will be presented.

The S.E.P.M. will hold a Dinner Meeting on Thursday evening, November 6, 1947, to be held at the Pasadena Athletic Club. The program will consist of two interesting papers by Dr. Earl Meyers and Dr. Parker D. Trask.

On Friday, November 7, 1947, the A.A.P.G. has scheduled a series of papers of general interest to Pacific Coast geologists. The afternoon session will be high-lighted by the talk to be given by E. DeGolyer, distinguished lecturer, on "Prospecting for Petroleum".

The meetings will terminate with a formal dinner dance on the evening of Friday, November 7, 1947, and all members of the affiliated societies are cordially invited.

The complete program for the two day session is as follows:

Thursday Morning,
November 6, 1947
Pacific Section of
American Association of
Petroleum Geologists

Introductory Remarks of Symposium on Occurrence and Production of Oil from Fractured Rocks in California—Rollin Eckis, Richfield Oil Corporation, Los Angeles, California. (Five minutes)

Occurrence and Origin of Chart in the Monterey Formation—M. N. Bramlette, University of California at Los Angeles, West Los Angeles, California (Twenty minutes)

Fractured Reservoirs of the Santa Maria District—L. J. Regan, Jr., General Petroleum Corporation, Santa Maria, and A. W. Hughes, Union Oil Company, Santa Maria, California. (Forty minutes)

Summary of Production from Fractured Rock Reservoirs in California—W. S. Eggleston, Union Oil Company, Los Angeles, California. (Twenty minutes)

Nomination of Officers for Pacific Section of American Association of Petroleum Geologists.

Thursday Afternoon

Oil Production from Fractured Rocks on West Side San Joaquin Valley—S. M. Reynolds, Consulting Geologist, Taft, California. (Twenty minutes)

The Nature of the Basement Complex Oil Reservoir, Edison Oil Field, California—J. C. May and R. L. Hewitt, Tide Water Associated Oil Company, Bakersfield, California.

Examples of Electrical Logs in Fractured Rocks—R. D. Ford, Schlumberger Well Surveying Corporation, Long Beach, California. (Thirty minutes)

Summary Remarks Concerning Occurrence and Production of Oil from Fractured Rocks in California —Rollin Eckis. (Twenty minutes)

Thursday Evening

A dinner Meeting of the Pacific Section of The Society of Economic Paleontologists and Mineralogists will be held at the Pasadena Athletic Club.

Environmental Significance of Fossil Foraminifera—Earl Meyers, formerly of Scripps Institution of Oceanography and John Hopkins Marine Laboratory, Monterey, California.

Determination of Potential Oil Source Rocks—Parker D. Trask, California Department of Natural Resources, Division of Mines, San Francisco, California.

Friday Morning

Summary of Geology and Exploration in Sacramento Valley—W. E. McKitrick, Shell Oil Company, Sacramento, California. (Thirty minutes)

Summary of Geology and Exploration in Salinas Valley—J. E. Kilkenny, Chanslor-Canfield Midway Oil Company, Los Angeles, California. (Thirty minutes)

Oil and Gas Prospects of Washington and Oregon—Hampton Smith, Consulting Geologist, Los Angeles, California. (Thirty minutes)

Relative Cost of Finding Oil in California—Graham B. Moody, Standard Oil Company, San Francisco, California. (Fifteen minutes)

Friday Afternoon

Prospecting for Petroleum—E. DeGolyer, Distinguished Lecturer of American Association of Petroleum Geologists, Dallas, Texas.

Friday Evening
8:00
A.A.P.G. Formal Dinner Dance
Huntington Hotel

All members of The Society of Exploration Geophysicists and The Society of Economic Paleontologists and Minerologists and friends are cordially invited.

Pacific Coast District Society of
Exploration Geophysicists
Thursday Morning
November 6, 1947

Address of Welcome, by Herbert Hoover, Jr., United Geophysical Company, Pasadena.

Greetings from National Officers of Society of Exploration Geophysicists by Cecil H. Green, Geophysical Service, Inc., Dallas, Texas.

A Symposium on Correlation in California—Lead paper, John Sloat, Union Oil Company, Bakersfield.

Thursday Afternoon

Practical Application of Curve Path Theory to the Migration of Dips—E. J. Handley, Century Geophysical Corporation, Tulsa, Oklahoma.

Case History of the Wilmington Oil Field—N. R. Shade, General Pe-

troleum Corporation, Los Angeles.

Case History of the McDonald Island Gas Field—Phillip P. Gaby and A. J. Solari, both of Standard Oil Company, San Francisco.

On the Penetration of Alternating Electric Currents into the Ground—G. W. Potapenko, California Institute of Technology, Pasadena.

Well Velocity Shooting in California—Robert J. Wells, Richfield Oil Corporation, Bakersfield.

Added Note on Well Velocity Shooting in California from the Standpoint of the C.W.V.S.G.—Dewitt E. Taylor, Shell Oil Company, Long Beach, California.

Society of Exploration Geophysicists Luncheon Friday—November 7

Cecil H. Green, National President of The Society of Exploration Geophysicists will lead a discussion regarding the formation of a Pacific Section of the Society.

Committees responsible for the convention:

Arrangements: Harvey Lee (AAPG), General Chairman; Wm. H. Corey (SEPM), Chairman; Curtis Johnson (SEG), Chairman; Bill Greenwalt; W. D. Lewis; A. J. McMillan, Jr.

Program: Jim Kimble, Chairman; Bob White, Co-chairman.

Finance: Bill Pemberton.

Publicity: Milton Lewis.

A.P.I. Oil Well Cement Subcommittee

The Special Subcommittee on Oil Well Cements, of the Topical Committee on Materials, is scheduled to hold its annual meeting November 10, at the Stevens Hotel, Chicago, during the 27th Annual Meeting of the American Petroleum Institute.

Under the chairmanship of R. Floyd Farris, the business agenda includes a discussion of the proposed A.P.I. code on cement testing procedures; cement evaluation tests for cement squeeze jobs; and specification limits on the properties of cements used in oil wells. Other subjects scheduled for discussion are: the effect of weight and viscosity on cement jobs; the effect of pumping rate on cement jobs; the effect of waiting time on cement jobs; the use of wall-cleaning scratchers on cement jobs; and the effect of rotating casing during cementing operations.

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California Oil World's Monthly Summary

DEVELOPMENT—PRODUCTION—SUPPLY & DEMAND
PACIFIC COAST TERRITORY

TABLE I—CALIFORNIA DEVELOPMENT—PRODUCTION

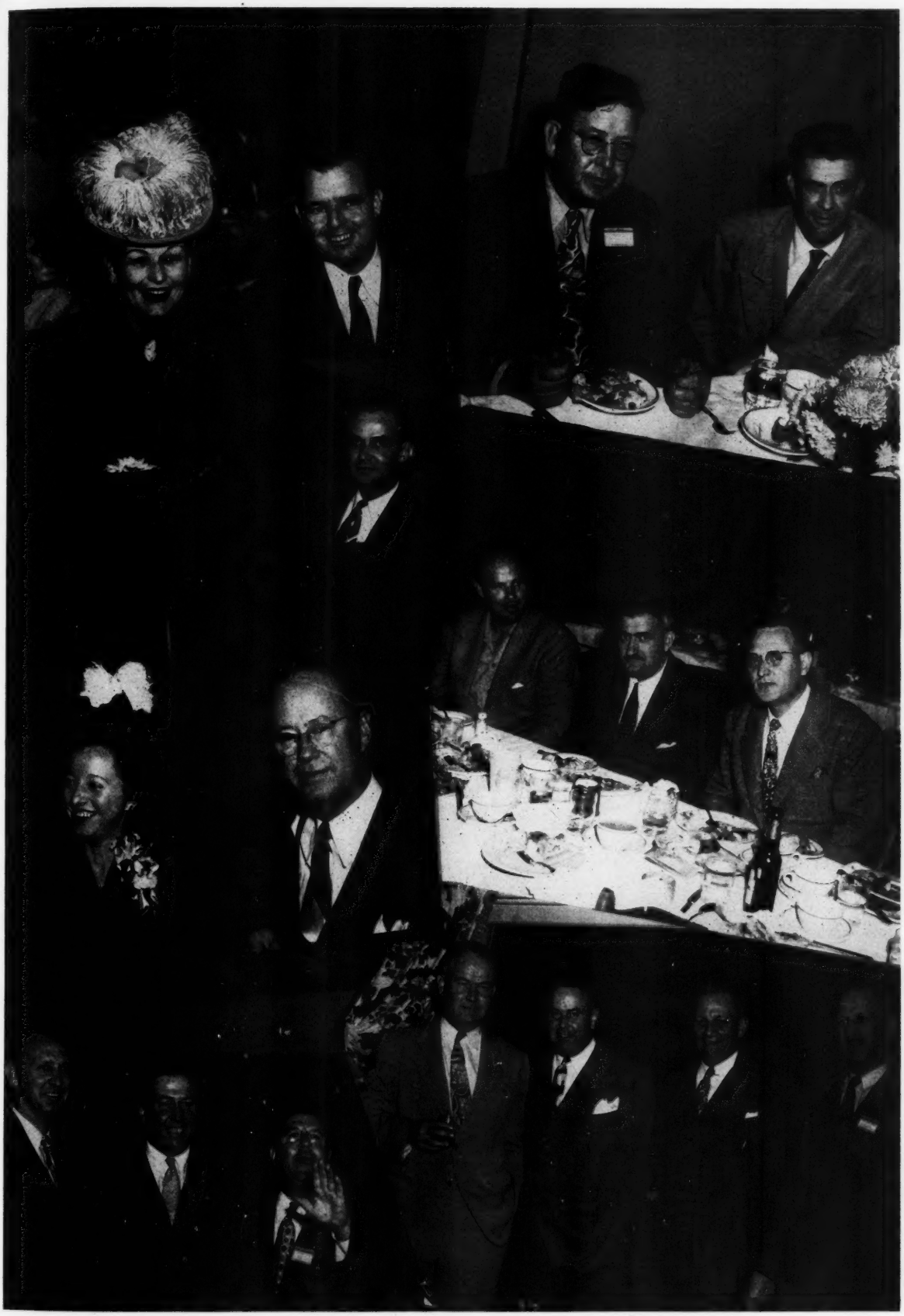
	AUGUST, 1947 DEVELOPMENT				PRODUCTION	
	Active Drilling Wells	Oil Wells Completed	Initial Production B/D	Oil Wells Completed First 8 Months	Daily Average August 1947	Daily Average August 1946
SAN JOAQUIN VALLEY REGION						
Ant Hill	.....	.....	.....	1	1,456	1,423
Bellevue	.....	.....	.....	.....	322	326
Belridge—North	.....	.....	.....	.....	5,782	5,081
Belridge—South	.....	.....	.....	20	5,468	10,648
Blackwell's Corner	.....	.....	.....	.....	159	215
Buena Vista Hills	.....	.....	.....	5	47,046	38,965
Canal	.....	.....	.....	.....	2,006	1,648
Coalinga Group						
Eastside	1	.....	.....	6	15,330	16,863
Oil City	.....	.....	.....	.....	85	104
Coalinga—Nose	.....	.....	.....	.....	52,796	48,967
Coalinga—Northeast	2	2	652	5	9,001	7,719
Pleasant Valley	1	.....	.....	1	4,342	3,411
Jacalitos	1	1	11	13	4,684	4,472
Westside	1	.....	.....	2	6,725	6,902
Coles Levee—North	2	.....	.....	6	16,729	15,731
Coles Levee—South	2	.....	.....	3	3,027	782
Edison	.....	.....	.....	9	10,943	14,641
Elk Hills	5	.....	.....	11	4,799	7,974
Fruitvale	.....	.....	.....	.....	6,491	7,551
Greeley	.....	.....	.....	.....	14,233	10,681
Helm	.....	1	240	3	4,078	4,177
Kern Front	4	1	41	19	9,018	8,955
Kern River	8	16	416	44	10,223	9,842
Kettleman North Dome	6	.....	.....	10	35,860	36,754
Lanare	.....	.....	.....	2	1,791	2,479
Lost Hills	6	7	535	64	5,519	3,497
McKittrick Group						
Belgian Anticline	3	1	552	2	809	.....
Cymric	2	2	16	26	17,034	9,751
McKittrick	.....	.....	.....	2	2,798	2,945
McKittrick Front	.....	.....	.....	9	1,636	1,524
Salt Creek	2	2	535	45	7,565	1,301
Sheep Springs	1	.....	.....	1	876	538
Temblor Ranch	.....	.....	.....	1	130	16
Midway-Sunset	7	4	271	35	43,368	41,716
Mt. Poso Group	1	1	24	7	13,672	15,820
Mountain View	4	2	1,013	11	5,399	3,727
Paloma	5	7	3,421	28	9,120	6,275
Poso Creek Group	.....	1	39	10	3,743	3,284
Pyramid Hills	.....	.....	.....	.....	264	295
Race Track Hill	2	1	152	8	2,167	1,714
Raisin City	.....	.....	.....	1	2,677	2,638
Rio Bravo	.....	.....	.....	.....	12,596	12,997
Riverdale	.....	.....	.....	2	4,402	4,491
Rosedale Ranch	.....	.....	.....	.....	84	133
Round Mountain Group	.....	.....	.....	5	8,043	8,948
Strand	.....	.....	.....	.....	1,307	2,103
Strand—East	.....	.....	.....	.....	501	606
Tejon Ranch	2	.....	.....	19	3,585	1,561
Ten Section	1	.....	.....	.....	7,125	9,090
Union Avenue	.....	.....	.....	.....	310	418
Wasco	.....	.....	.....	.....	201	701
Wheeler Ridge	.....	.....	.....	.....	200	234
Williams	.....	.....	.....	.....	1,216	1,529
Other Fields	2	.....	.....	11	678	251
TOTAL SAN JOAQUIN VALLEY REGION	71	49	7,936	447	429,419	404,414
COASTAL REGION						
Santa Maria District						
Casmalia	.....	1	101	1	804	417
Cat Canyon—East	.....	.....	.....	.....	720	193
Cat Canyon—West	6	3	889	27	10,597	7,692
Four Deer	.....	2	224	2	176	.....
Gato Ridge	1	.....	.....	.....	3,395	3,675
Lompoc	1	4	873	31	5,229	1,167
Orcutt	3	2	153	19	4,635	3,520
Santa Maria Valley	5	2	26	20	24,609	32,311
Tinaquaic	.....	1	150	1	4	.....
Zaca Creek	1	.....	.....	.....	387	328

COASTAL REGION—Continued

	AUGUST, 1947 DEVELOPMENT				PRODUCTION	
	Active Drilling Wells	Oil Wells Completed	Initial Production B/D	Oil Wells Completed First 8 Months	Daily Average August 1947	Daily Average August 1946
Santa Barbara District						
Capitan	.....	.....	.....	.....	2,803	3,520
Elwood	.....	2	360	5	7,160	7,110
Santa Barbara	.....	.....	.....	.....	95	67
Summerland	.....	.....	.....	.....	.....	4
Ventura District						
Montalvo—West	2	.....	.....	1	138	.....
Padre Canyon	2	1	161	5	3,101	2,423
Rincon	.....	.....	.....	.....	3,586	4,254
San Miguelito	4	1	*188	6	5,240	5,114
Ventura Avenue	9	3	1,423	30	50,538	47,002
North Santa Clara District						
Del Valle	3	4	487	16	8,539	6,420
Hopper Canyon	.....	.....	.....	1	166	231
Oak Canyon	.....	.....	.....	1	1,580	1,662
Ramona	.....	.....	.....	1	.....	.....
Sespe Canyon Group	.....	.....	.....	.....	159	267
Temescal	.....	.....	.....	.....	597	629
Others	1	.....	.....	1	353	210
South Santa Clara Valley District						
Aliso Canyon	1	.....	.....	3	3,329	3,146
Bardsdale	1	.....	.....	2	410	380
Newhall-Potrero	4	2	618	6	7,113	5,934
Oxnard	1	.....	.....	1	1,551	937
Shiells Canyon	.....	.....	.....	3	1,033	1,133
South Mountain	2	.....	.....	11	5,286	3,592
Others	2	2	110	20	1,730	293
San Luis Obispo and Santa Clara Counties	.....	3	97	9	174	19
TOTAL COASTAL REGION	49	33	5,860	225	155,237	143,686
LOS ANGELES REGION						
Brea-Olinda	2	3	403	18	12,066	10,755
Coyote—East	2	1	52	8	4,766	4,584
Coyote—West	3	2	769	13	15,026	14,977
Dominguez	2	1	127	9	14,797	15,574
East Los Angeles	2	.....	.....	3	1,249	624
El Segundo	.....	.....	.....	.....	470	533
Huntington Beach	9	13	1,081	48	50,036	47,067
Inglewood	2	.....	.....	1	11,869	12,569
Long Beach	1	.....	.....	8	23,390	24,830
Montebello	.....	.....	.....	1	7,254	8,445
Newport	2	3	729	42	7,212	6,004
Playa Del Rey	.....	.....	.....	.....	2,051	2,437
Potrero	1	1	241	1	985	863
Richfield	.....	.....	.....	6	6,568	7,167
Rosecrans-Athens Group	2	.....	.....	2	4,564	4,949
Santa Fe Springs	1	.....	.....	.....	16,091	16,677
Seal Beach	3	1	750	11	10,971	10,236
Torrance	.....	.....	.....	2	7,829	8,379
Whittier	.....	.....	.....	1	1,007	1,016
Wilmington	26	15	4,882	131	132,607	119,601
Yorba Linda	.....	.....	.....	.....	250	255
Other Fields	1	2	826	3	1,970	1,144
TOTAL LOS ANGELES REGION	59	42	9,860	308	333,028	318,686
EXPLORATORY						
Outpost Wells	33	.....	.....	.....	.....	.....
Wildcats	19	.....	.....	.....	.....	.....
Gas Wells	3	5	Gas	36	.....	.....
TOTAL CALIFORNIA	234	129	23,656	1,272*	917,684	866,786

*—Includes gas wells completed and 256 drilling wells abandoned.

Candid Photos Taken at Annual A.A.O.D.C. Convention, Long Beach, California



Candid Photos Taken at Annual A.A.O.D.C. Convention, Long Beach, California

Candid Photos Taken at Annual A.A.O.D.C. Convention, Long Beach, California

Personalities IN THE NEWS

Contractors Elect E. C. Brown To Head Organization

At the Long Beach Meeting of the American Association of Oil Well Drilling Contractors the following officers were elected for the 1948 term:

E. C. Brown, Long Beach, President; Joe S. Morris, San Antonio, Tex., Vice President at Large; George S. McQueen, Fort Worth, Vice President for West Texas and New Mexico; D. B. Ferguson, Carmi, Ill., Vice President for Cable Tools; Lester D. Cain, Houston, Vice President for Central Mid-Continent; D. H. Graham, Long Beach, Vice President for California; R. M. Olds, Mt. Carmel, Ill., Vice President for Illinois, Michigan, Indiana and Kentucky; J. Zeppa, Tyler, Texas, Vice President for Cretaceous and Tertiary Basins; E. E. Pickering, Houston, Vice President for Well Servicing; C. J. Paine, Dallas, Treasurer; Brad Mills, Executive President; and J. Doyle Settle, Dallas, Secretary.

Advances Made in Texaco Engineering Dept.

W. A. (Bill) Clark, Division Engineer, Producing Department, Pacific Coast Division of The Texas Company, has been transferred to Foreign Producing Operations as Assistant Manager, with headquarters in New York City, it was announced recently by James T. Wood, Jr., Division Manager, Producing Department, Pacific Coast Division. H. O. Woodruff replaces Clark as Acting Division Engineer, and O. W. Chonette assumes the duties of Acting District Engineer, Los Angeles Basin District.

Clark, a native of Montana, was first employed by the company in 1929 as Assistant Petroleum Engineer at Santa Fe Springs, and also served as Petroleum Engineer at Bakersfield and Fellows until November 1944 when he was appointed Division Engineer. He graduated from Stanford University in 1926 with an AB Degree in geology.

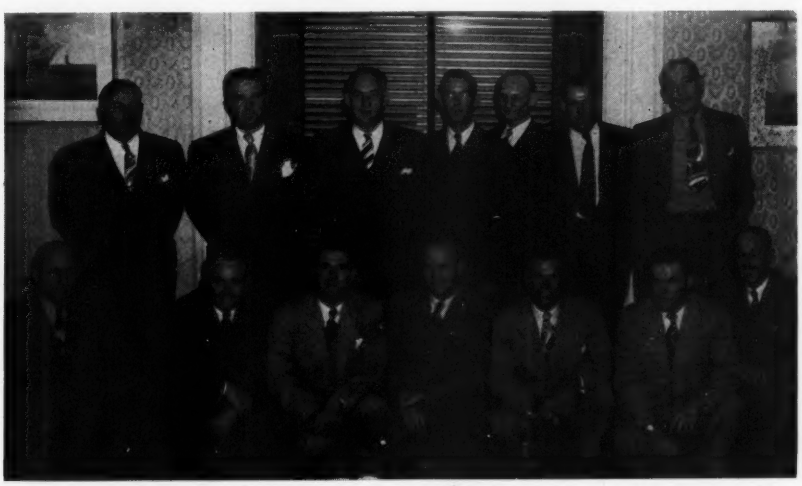
Woodruff, a native Californian, graduated from the University of Southern California in 1933 with a degree in petroleum engineering, and started with the company in 1933 as Roustabout in the South Mountain Field in Ventura County.

Chonette, a native Californian, graduated from the University of California at Berkeley in 1932 with a degree in mechanical engineering, and joined the company in 1938 as Engineer in the Producing Department at Long Beach.

Continental Oil Co.'s new office in the remodeled Moronet Bldg., in Bakerfield is housing the production, land and geological departments. R. H. Haines is district geologist, Fred Howard, production superintendent, and H. F. (Tax) King, district landman. King recently came to California from Oklahoma, where he also was associated with Continental operations.

Don E. Gilman, chairman of the district 5 committee of the public relations group of the American Petroleum Institute, has returned to Los Angeles from a trip to Phoenix, Ariz. During his stay at Phoenix, he met with representative oil men for the purpose of organizing a branch there of the public relations body.

Dorothy A. McAllister of the Shell Los Angeles office is an air enthusiast and in her spare time is completing her pilot training. She has advanced to the point where she is studying for an instrument rating, or as otherwise known blind flying. A draftsman in the Los Angeles survey and drafting depart-



Pictured are the foreign guests at the October meeting of the Los Angeles Chapter of Nomads. Norcott Arnett, International Petroleum Co.; Jose Ovidio Martinez, Langley & Cia; G. H. Allen, Burma Oil Co.; D. S. Pickeathly, Anglo Iranian Oil Company; D. D. Donovan, International Petroleum Co.; R. B. Donovan, Consolidato de Pet. Co.; John L. Alber, International Petroleum Co.. (Standing, left to right) R. B. Block, International Petroleum Co.; Jay P. Gould, Iraq Petroleum Co., Ltd.; O. S. Woodard, Drilling & Exploration Co.; H. F. Tyner, Richmond Exploration Co.; Wayde A. Duncan, Burma Oil Co., Ltd.; B. A. Horan, Tropical Oil Co.; Leo E. Chisolm, International Petroleum Co.

ment, all that have seen Miss McAllister up in the blue, say she makes flying look easy.

Ronald E. Kaehler, president of the San Francisco Stock Exchange, headed a group of 40 members of the exchange, which made an educational air tour of expanded oil facilities in oil fields in the Los Angeles Basin.

C. B. Edington, Los Angeles oil man and former Long Beach refiner, has organized the Southern Steel Co. for the purpose of engaging in the buying of all types of petroleum industry scrap iron and steel. The material salvaged in turn will go to the Kaiser Mills at Fontana, Mr. Edington reported.

Allen Dreeben, who recently appeared in "Call Me Mister," a musical at the Los Angeles Biltmore Theater, once was an active oil driller. Failing to strike oil in Texas, he moved to Times Square and soon did well in New York with several dramatic "gushers."

George Norman, engineering department of Southern Counties Gas Co., has returned to the general offices after spending several months in the desert surveying for the Texas-California gas pipeline.

A recent Ventura visitor was J. B. Bryant of Shell Oil Co. in the Long Beach area. While in the Coastal city, Bryant visited relatives residing there.

W. B. (Wally) Curtis of General Petroleum, vice chairman, district 5 public relations committee of the American Petroleum Institute, was a principal speaker at the meeting of the San Joaquin Valley chapter of the API at the Bakersfield Inn, Bakersfield. He discussed the petroleum industry public relations program. Douglas Jones of Axelson Manufacturing Co. spoke on aspects of deep well pumping. The development of the Tejon Ranch oil field was the topic of an address by Kemnitzer, Richards & Diepenbrock, consulting engineers.

Fred M. Manning, prominent drilling contractor in the Rocky Mountain district, and Carl Cross have organized the Coastal Drilling Co. in Bakersfield to extend operations to California.

Congressman Bertrand Gearhart, House Ways and Means Committee member, and Wesley Disney, petroleum industry representative in Washington, were the chief speakers at the oil men's joint tax meeting in San Francisco on October 29-31. Discussions at the meeting were led by Charles R. Bell, Lloyd C. Gibson, John M. Dressler, Frank J. Blaise, Hilary Mahin and George Koch.

H. F. Peterson, manager of surveying and mapping for Shell Oil, will direct fall and winter instructions in oil mapping at UCLA. Arrangements for the course were made by the educational committee of the Oil Map Association and the division of engineering at the association.

The Annual Meeting of all Division Sales Managers of the Reed Roller Bit Company was held in Los Angeles a few days in advance of the National Meeting of the American Association of Oil Well Drilling Contractors.

Pictured at the Meeting, front row, left to right:
E. M. Donovan, J. F. Knight, S. P. Hazlip, A. G. Chandler, J. B. Harder, W. B. Noble, R. V. Ellis.

Second row:
A. W. Crawford, R. C. Gann, H. O. Heller, J. R. Brandon, Jr. W. E. Scarbrough, B. F. Hanly.

Rear row:
B. A. Wendt, H. S. Vaile, C. A. Nabors, H. W. Alexander, R. F. Roberts, R. G. Hamaker, W. L. Childs, Jr., E. A. Miller, W. H. Armstrong, F. L. Tyler.

Mr. Donovan was a guest of the Reed family, and is with the Martin-Decker Corporation.

Field Development

PREPARED FROM CALIFORNIA OIL WORLD NEWS SERVICE

Los Angeles Basin

Anaheim Venture Drilling Deeper

Southwest of the city of Anaheim, Tide Water Associated is drilling ahead at 6049 ft. with Nel-Cal-Lu Comm. No. 1 in Sec. 21-4s-10w, Orange County.

Elsewhere in the county, Shell Oil has made location for Watson-Nau No. 1 in Sec. 31-5s-10w in the West Newport area. Republic Operators, Inc., has completed Newland No. 3 in Sec. 12 -6s-11w, flowing at the rate of 200 barrels of 18 gravity oil daily, cutting 1 per cent. Plugged depth is 3040 ft. Morton & Kohlbush is about to spud Anaheim Sugar No. 7-2 in Sec. 7-6s-10w. Ground is being graded for Honolulu Oil's Farnsworth No. 37-7 in the section.

Orange County in recent days chalked up three oil production failures. They were Fullerton Oil's Dominguez No. 1 in Sec. 30-3s-8w in the Richfield area,, Landess Oil's No. 1 in Sec. 31-3s-8w in the Santa Canyon area and Morton and Sons' Irvine No. 56-1 in Sec 24-6s-10w in the Corona Del Mar area. Respective depths were 3120, 1453 and 6770 ft. The Irvine project failed to recover fish.

Inglewood Try Recements

Basin Oil has recemented its Inglewood Comm. No. 2-1 in Sec. 28-2s-14w in the Inglewood area, after water shut on the 7-in. casing set at 9947 ft. proved no good. Total depth is 9952 ft. The formations encountered on the way to bottom compare with those found in the company's two previous drilling jobs. Slightly less than a mile from the Basin project, Standard of California is coring at 2082 ft. with L. A. I No. 1-87 in Sec. 17-2s-14w. No. 1-90 in Sec 8 is rigging up. In Sec. 7-2s-15w, Cleveland Oil is drilling at 6736 ft. with Machado No. 6-A.

San Berdoo Try Drills

In the Hesperia area of San Bernardino County, Allied Oil & Gas Corp. is making hole ahead below 2000 ft. with Chief No. 1 in Sec. 17-4n-1w. Meantime, Chino Hills Oil Co. is drilling at 103 ft. with Chino Hills No. KB-4 in Sec. 33-2s-8w in the Chino Hills area.

Newhall Test Put On Pump

On open hole test, Aurora Corp.'s Braille No. 2 in Sec. 1-3n-16w in the Newhall area pumped water at the rate of 50 barrels daily, along with a trace of oil. Bottom is 3586 ft. Mutual Development is reaming Lassalle No. 1 wildcat in Sec. 10-3n-16w. Standard's Frew No. 1 in Sec. 29-3n-16w is digging at 2156 ft. The company's Newhall L. & F. No. 5-1 in Sec. 34-4n-16w is drilling at 5874 ft. Near Castaic, L. R. Wilhite and Claude Kavanaugh are rigging up to start the drill in Wilhite Jenkins No. 1 in Sec. 18-5n-16w. In the Elsmere

Baverwell No. 44-117, south of Garden Grove, Calif., being drilled by San Joaquin Drlg. Co., for Seaboard Oil Co. Reading from left to right: H. W. Allen, Cathead; R. D. Shamplin, Rotary; E. B. Sahr, Driller; W. R. Ellsworth, Rotary, J. R. Ormsby, Derrick.

sector, Philips-Ramsey Oil Co. is nearing the spudding stage with Kraft No. 1 in Sec. 31-4n-15w.

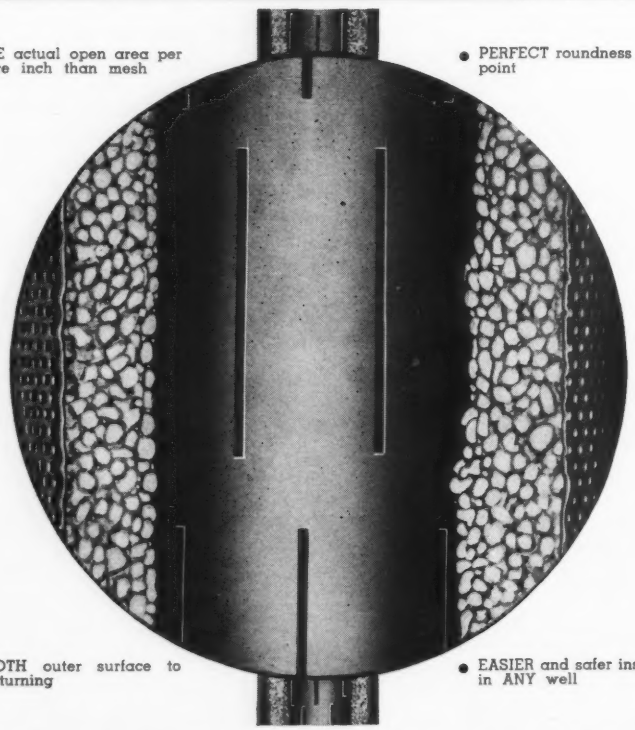
Los Angeles Try Rigging

In the East Los Angeles area, Richfield Oil is rigging derrick for U. S. Rubber No. 1 in Sec. 16-2s-12w, a slant drilling job to sub-surface beds below the 35-acre site of the United States Rubber factory at 5875 Anaheim-Telegraph road. The adjoining 15-acre Pacific Tubing Co. property is reported in line for drilling. The mineral rights there are said to be owned by Colonel D. D. Stewart of Louisville, Ky., a comparative newcomer to the California oil business.

Richfield's Vail No. 3 is preparing to pump from 9200 ft. L. A. River Comm. No. 1-1 is about to start the drill.

Canoga Park Test Planned

Vincent F. Stabeck has location staked for Knapp No. 4 in Sec. 4-1n-17w in the Canoga Park area of Los Angeles County.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Long Beach Well Gives Up

Shell Oil has given up at 5506 ft. its Alamitos No. 49 in the Long Beach area, after drill pipe stuck and surface casing collapsed. The rig has been skidded 140 ft. southeast to location for No. 49-A. Los Nietos Co. has decided to look for the deep sand and has made location for L. B. Comm. No. 1 in Sec. 33-4s-12w. General Petroleum's L. P. C. No 4 in Sec. 29 is reaming, with hole bottomed at 8876 ft Pacific Western's Hilton & Stanton No. 1 is making hole at 3235 ft.

Civic Association Approves Drilling

The board of directors of the Los Angeles Chamber of Commerce has advised the City Planning Commission that oil drilling should be permitted in the city under provisions of the municipal code.

President C. S. Beesemyer gave the board's opinion in conjunction with requests of Richfield Oil Corp. and Boyle Royalties Co. for permission to drill for oil in the Boyle Heights area of Los Angeles.

The chamber executive explained that a great number of property owners in the area favor oil development and before drilling may be permitted 51 per cent must have reached royalty agreements with the operating companies.

"When wells are completed," he said, "derricks must be dismantled and all machinery be emplaced belowground level and covered. Drilling areas must be landscaped and fenced and will have considerable artistic appeal."

West Newport Deepening Job

Westates Petroleum Co. of San Francisco is preparing to deepen the Coast Exploration Co.'s Radio No. 1 in the West Newport field. Present depth is 3800 ft. and the new objective will be the C zone.

Rosecrans Test Deep

Union Oil's Rosecrans No. 48 in Sec. 19-3s-13w in the Athens- Rosecrans area is coring at 11,484 ft.

Coastal and Northern District

Conejo Test Standing Idle

Idle at 6465 ft., describes the present operational stage of Ti-Bell Drilling & Roy, Inc., Janss No. 1 in Sec. 33-2n-19w in the Conejo area, Ventura County.

Ojai Test Running Pipe

Richfield Oil is ready to run casing in its Ojai No. 49 in Sec. 13-4n-22w in the Ojai area, Ventura County. Total depth is 4028 ft.

San Ardo Area Still Intrigues

Texas Co. is rigging up to begin drilling its Lombardi No. 1 in Sec. 27-22s-10e in the San Ardo area, Monterey County. The new explorer is about a half mile from North American-Jergins No. 1 in Sec. 34, which found showings at several intervals before abandonment in granite at 2500 ft. The North American-Jergins combination may drill another well in the general area, provided a more favorable location on structure is obtained. Twisselman No. 1 in the San Lucas area of the county was recently abandoned at 534 ft., after an electric log run and side wall sampling. Site was in Sec. 25-21s-9e.

Oxnard Well Builds Tanks

Storage tanks are under construction for Parisinoil Co.'s Todd No. 2 in Sec. 6-1n-21w. The well is bottomed at 3908 ft. Signal Petroleum of California is preparing to rebuild rig on Shunate No. 1 in Sec. 28-2n-21w, after rig collapsed while working on 7-in. casing set at 2260 ft. Total depth is 2725 ft.

Colusa Test Makes Progress

Standard of California's Williams Comm. No. 1 test in Sec. 33-15n-2w in the Williams area of Colusa County is drilling slightly below 2000 ft. Suisun Comm. No. 7 in Sec. 5-3n-1w in gas country in the Suisin area of Solano County is cleaning out at 2880 ft. Total depth is 3282 ft.

Cache Slough Gas Try Fails

Having run electric log and side wall sampled for a final check, Amerada Petroleum has abandoned its Liberty Farms No. 1 gas test in Sec. 13-5n-2e in the Cache Slough area, Solano County. Bottom is 4750 ft.

Kirby Hills Test Grading

Bishop Oil Co. is working on lo-

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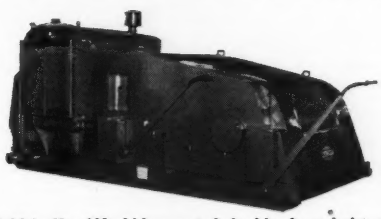

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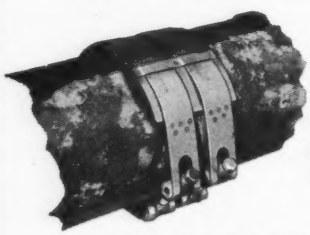

1100 P.S.I. Maximum

3 types for all pipe from 2 to 8 inches.

Largest size weighs only 6 pounds.

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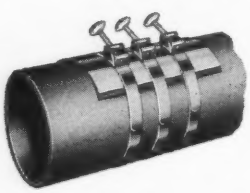

6 sizes fit all pipe from 1/2" to 12".

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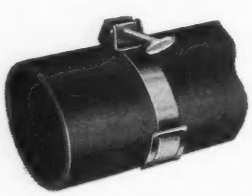

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INGLEWOOD CALIFORNIA

cation for Bishop-Calaveras-Triguero No. 1, a gas test in the Kirby Hills in Sec. 5-3n-1e, Solano County. Shell Oil, meanwhile, is fishing for drill pipe in its Lambie No. 6 in Sec. 30-4n-1e, with top placed at 2598 ft. The venture went to a total depth of 7896 ft., before plugging back to 7147 ft. Lambie No. 5 is a location in Sec. 25. Harper No. 1 in Sec. 14 is grading location.

Huasna Try Rigs Derrick

Spudding is not many days away in Danciger Oil & Refining Co.'s Twitchell No. 1 in Sec. 35-32s-15e in the Huasna area of San Luis Obispo County. The try at last reports was just about completely rigged.

Bolinas Test Makes Headway

L. M. Lockhart's interesting wildcat test in the Bolinas area of Marin County is making steady progress with the drill below 2250 ft. The prospect is known as Tevis No. 1 and is in Sec. 7-1n-8w.

Sespe Try Scheduled

Kirk Oil Co. has location staked for Edwards No. 1 test in Sec. 27-4n-19w in the Sespe area, Ventura County. Eagle Rock Petroleum's Eagle Rock No. 1 in Sec. 36-5n-20e is fishing for bit, with present depth of the hole 527 ft. In the Sespe Parks area, Republic Operators, Inc., has pulled rods and tubing from Arundell No. 6-1 in Sec. 6-4n-19w, after the well pumped muddy water along with oil and gas shows. Total depth is 4010 ft., with casing set at 3150 ft. Some 910 ft. of pipe, including 860 ft. of perforated, was landed at 4008 ft.

Lloyd Enters Montalvo Area

Foundation is in for Lloyd Corp., Ltd., B-K No. 1 in Sec. 23-2n-23w in the Montalvo area of Ventura County. Richfield is cleaning out to test water shut off on the 7-in. casing set at 10,003 ft. in Del Cielo No. 1 in Sec. 30-2n-22w. Texas Co.'s J. V. No. 1 in

Sec. 24-2n-23w is spot coring at 8745 ft. Electric log was run at 8400 ft. Standard's Maxwell No. 1 in Sec. 23-2n-23w is making hole at 13,973 ft. McGrath No. 65-3 in Sec. 30-2n-22w is down 9865 ft. and cleaning out at 8784 ft.

Moorpark Try Goes

Near Moorpark in Ventura County, Jergins Oil Co. is drilling deeper at 6967 ft. with Moorpark No. 1 test in Sec. 16-3n-19w. Present formation is composed of Sespe shale and sand.

Fourdeer Job Tests Shut Off

Having cemented 7-in. casing on bottom at 5850 ft., Sunray Oil Corp. is now testing water shut off in its Los Flores No. 3 in Sec. 4-8n-33w in the Fourdeer area, Santa Barbara County. No. 4 is a rig. No. 1-A is idle at 940 ft., after swabbing dry.

Reports from New York indicated that two oil firms may soon merge with the Sunray organization. An announcement said that at meetings of the respective boards of directors, a merger of Pacific Western Oil Corp. and Mission Corp. into Sunray was approved. If the merger is finally consummated, Sunray will own all of Getty Realty Corp., which owns and operates the Hotel Pierre in New York City, and also will own 59 per cent of the stock of Skelly Oil Co. Assets to be acquired by Sunray include about 30 per cent of the common stock of Tide Water Associated Oil Co.

Santa Paula Try Resuming

T. M. Gibson is preparing to resume drilling operations in Portillo No. 1 in Sec. 26-4n-21w in the Santa Paula area. Present depth is 185 ft.

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Goleta Test Grades Ground

Honolulu Oil Corp is working on location for Honolulu-Signal Macco No. 309-RDA-1 in Sec. 19-4n-28w in the Goleta area. Two previous prospect jobs in the area are idle at 6741 and 4934 ft., respectively.

Cat Canyon Try Redrills

Redrilling has reached 4645 ft. in General Petroleum's Realty No. 73-10 in Sec. 10-9n-33w in the Cat Canyon area. Original depth in 5050 ft. East of the Cat Canyon field, Union Oil is drilling McCroskey No. 2 in Sec. 20-9n-32w at 5159 ft.

Nipomo Test Drills Ahead

Mary C. Phelan No. 1 test, sponsored by Union Oil in Sec. 32-12n-34w in the Nipomo area of San Luis Obispo County, is drilling on down at 4057 ft. Location falls a short distance from the Wineman ranch, where the company drilled in recent months two test wells without obtaining commercial oil. Under consideration by the company is a wildcat in Berros Canyon, northwest of the present activity. North of Gato Ridge, Wickenden No. 1-2 in Sec. 28-9n-32w is drilling at 2224 ft.

Saticoy Test Going Ahead

Superior Oil continues to prospect ahead at 9512 ft. with Saticoy No. 1 in Sec. 10-2n-22w in the Saticoy area. The 7-in. casing froze and was cemented at 9473 ft.

Orella Try Rigs Derrick

Shell Oil is rigging up and is expected in a few days to start the drill in Careaga No. 2-1 in Sec. 36-5n-21w in the Orella area, Santa Barbara County.

Pioneer Anticline Wildcat Prospects

Drilling in hard shale at 4340 ft. describes the current status of Western Gulf Oil Co.'s B. & M.-U. S. No. 1 wildcat test in Sec. 30-11n-23w in the Pioneer Anticline area of San Joaquin Valley. The company has nine drilling jobs in the Paloma field at various stages from locations to making hole.

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Coalinga Tests Drill On Down

Sharples Oil Corp. is drilling at 7746 ft. in brown shale with Fleishacker No. 85-1 in Sec. 1-19s-15e in the Northeast Coalinga area. Lillis No. 88-18 in Sec. 18-18s-15e, meantime, is exploring at 4590 ft.

San Joaquin Valley

Earlimart Test Drills

Pacific Western has spudded in its Brunner No. B-1 deep test in Sec. 16-24s-25e in the Earlimart area of Tulare County and at last reports had carried the hole on down to 1139 ft. The venture is about five miles northwest of Delano and three miles west of Pacific Central's abandoned Divizich No. 1.

Location has been staked for Waechter No. 24 in Sec. 32-15s-17e in the San Joaquin area, Fresno County. Superior Oil early this year drilled its Hakala No. 55 to around 7170 ft. and thus completed a real discovery well. P. H. Greer No. 53 in Sec. 9-31s-29e in the Arvin area is digging below 5200 ft. Rankin No. 85-30 in Sec. 30-30s-22e in the McKittrick area is ready to conduct a formation test. Total depth is 6288 ft., with plug at 6040 ft. Midway-McKittrick No. A-63-30 and No. A-83-30 in the section are grading ground.

Mt. View Try Works

With hole bottomed at 6000 ft., American Oil Corp is running electric log in Kennedy No. 1 test well in Sec. 9-30s-28e in the Mountain View area.

San Emigdio Test Redrills

Apex Petroleum Corp., Ltd., is redrilling at 1100 ft., with Los Lobos No. 1 in Sec. 5-10n-22w in the San Emigdio area, a sequel to cementing whipstock at 450 ft. The project went originally to 3505 ft. and in so doing found interesting showings at a number of levels.

Kern Bluff Test Staked

Oceanic Oil has staked location for another drilling job in the Kern Bluff area. The new try will be known as Needlum-Bleomer No. 16 and will drill in Sec. 7-29s-29e. The company's first well was completed at the shallow depth of 935 ft., pumping approximately 80 barrels of clean oil daily.

Oceanic divides interest in development there with Universal Consolidated. The combination holds 480 acres in the area.

Dewy Lease Wildcat being drilled by A. V. Livingston Drilling Co., 4 miles east of Whittier on 1st Ave. Front row, left to right, J. H. Mitchell, Rotary; A. V. Livingston, Drlg. Contractor; back row, left to right: Bill Wilder, Rotary; Pat Dennis, Cathead; W. T. Blair, Driller; Geo. Schubert, Visitor; J. P. Jones, Derrick; Alfred Morse, Rotary.

Round Mountain Well Pumps Oil

Barnsdall Oil has completed as a pumper its Alma No. 2 extension test of the Round Mountain field. Tagged Alma No. 2 and in Sec. 15-28s-28e, the well went to a total depth of 2793 ft. for an initial yield of 324 barrels net of 13 gravity oil. The Olcese was topped at 933 ft., Pyramid Hills at 2727 ft., and Vedder at 2775 ft. Independent Exploration is represented in the area by considerable acreage and Barnsdall's new well is on a farm-out from Independent.

Ant Hill Test Making Progress

Near the Ant Hill field, General Petroleum last was reported drilling Cottonwood No. 68-24 test in Sec. 24-29s-29e below 1000 ft. Ninkovich No. 62-9 in Sec. 9-30s-21e in the McKittrick area, which also flies the G. P. banner, has been spudded and is making hole in the shallower formations.

Arvin Area Adds Tester

Arvin is the scene of a new test well sponsored by British-American Oil Prod. and the Capital Co. in Sec. 26-31s-29e. It is called No. 1.

San Emigdio Prospect Digs

The KCL No. L-2 prospect job, undertaken by Continental Oil in Sec. 5-11n-21w in the San Emigdio area, is drilling ahead below 10,650 ft. Santiago No. 1 in Sec. 8-11n-22w is a location.

Edison Try Digs

Davis Investment Co.'s Bauman No. 1 test venture in Sec. 8-30s-30e in the Edison area is drilling at 950 ft. In the field proper, Des Moines Oil Co. is redrilling at 3250 ft. with Cauley No. 5 in Sec. 16-30s-29e.

Devils Den Try Working

Casing is being pulled from S. R. DeKalb's Blake No. 16 in Sec. 25-

25s-18e in the Devils Den area. Total depth is 1115 ft. and the pipe was set at 890 ft.

Comanche Pt. Wildcat Scene

Richfield Oil has made location for S. P. No. 10 in Sec. 25-12n-19w in the Comanche Point area of Kern County. It will drill not far from L. C. Gould's No. 1 test in Sec. 32-12n-18w, which is standing with casing cemented at 405 ft. The hole was carried to 1592 ft., before plugging back to 670 ft.

McKittrick Test Cased

The 7-in casing has been cemented at 6530 ft. in Texas Co's Tulare NCT One No. 17-28 in Sec. 28-30s-22e in the McKittrick area, with hole bottomed at 6536 ft. On formation test of two intervals between 6460 and 6508 ft., the project flowed at the rate of 22 barrels of oil an hour through a 14/64-in. bean and cutting 8 per cent. Gas yield was rated at 4,000,000 cubic ft. daily

Westpet NCT Two No. 14-29 in Sec. 29 is rigging up.

In the Wheeler Ridge area, KCL No. 26-1 in Sec. 1-10n-20w is prospecting ahead at 3236 ft. Richfield's KCL No. C-1 in Sec. 20-11n-20w is making hole at 6716 ft.

Middle Dome Try Redrills

Standard of California continues to make hole with its redrill of No. 73-30V in Sec. 30-23s-19e in the Middle Dome area of Kettleman Hills. Original depth was 12,389 ft. and the redrill job is down 11,242 ft.

In the South Dome area, the company's S.F. & F.L. No. 4-2 in Sec. 12-25s-19e in digging deeper at 6100 ft.

Cymric Adds Producing Well

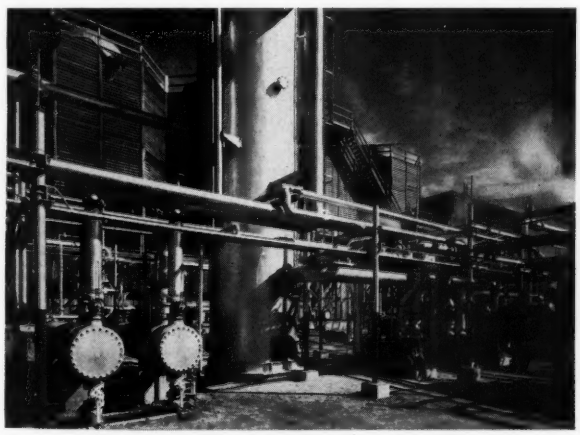
Independent Exploration has finished at 4760 ft. its Cymric No. 12 A in Sec. 21-29s-21e in the Cymric area. Initial flow was 42 barrels a day through a 12/64-in. bean, with tubing pressure 1850 pounds, and casing, 1900 pounds. No. 23 is drilling below 1300 ft. In Sec. 28-29s-21e, McDonald-Purdy No. 81-28 is drilling in shale at 5373 ft.

Raisin City Venture Cores

Near Raisin City in Fresno County, Lowry R. Lytle is coring at 6320 ft. with Petrol-Kerckhoff No. 1 in Sec. 36-14s-16e. Mission Oil Co.'s No. 42-19 in Sec. 19-15s-17e is standing with casing cemented on bottom at 5237 ft. This move followed run of electric log.

Jacalitos Try Spotting Oil

Oil is being spotted in an effort to remove drill pipe stuck in Standard's Ferguson No. 21-6n test in Sec. 6-22s-16e in the Jacalitos area. Present depth is 6762 ft. Standard's Lerdo Land Co. No. 10-6 in Sec. 7-28s-27e in the Premier area has been abandoned in gray sand at 3597 ft.



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Injection Rates of Water-Input Wells in Water Flooding

Many of the water-injection problems bearing on water flooding are of broad interest even in areas where water flooding is not practiced. The properties of the injected water, its effect upon sand permeability, and factors affecting efficient injection often suggest comparisons with what happens when water enters sands in other ways, such as from drilling fluids.

The problem of maintaining and increasing injection rates at water-input wells has been studied by the Eastern District members of the A.P.I. Topical Committee on Production Technology. The following abstract gives the summary and conclusions of the authoritative paper by Dickey, Buckwalter, Andersen, Heck, Holbrook, Young, Bossler, and Tayler, which was recently released.

Water flooding for the purpose of producing oil has been practiced successfully in the Bradford and Allegany Fields for many years. Numerous properties have reached their economic limit, and many more are approaching it. Very often it is observed that, during late stages of a flooding operation, not only oil production decreases to a low value, but water-injection and water-production rates do likewise. Such behavior of a water flood operation contradicts all theoretical predictions. During the latter stage of a water flood, very frequently the flooding process becomes highly inefficient, and the principal reason for such inefficiency is the fact that water-input rates have not been maintained in the most favorable manner possible. It has been recognized that maintaining and increasing water-input rates can be of great benefit.

Effect of Input Rates

There are three types of factors which control water-input rates: practices exercised by the operator in the completion and operation of the wells; physical and geological factors of the reservoir; and, finally, time factors. With time, input rates frequently decline beyond a rate of decrease, which can be justified by changing conditions in the reservoir. Diminishing intake rates cause diminishing flow of fluids in the reservoir and, therefore, small oil production. By means of field examples, the authors demonstrated that oil production has been increased by increasing water-injection rates due to higher pressures. An hypothetical example of increasing water-input rates indicates several economic advantages of the increased rates of production. Advantageous results are obtained by increasing input rates up to some indeterminate optimum flooding rate. This optimum flooding rate varies from property to property when all economic and physical factors are considered together.

Sand Affects Water Movement

The medium which greatly determines the input rates at a well is the flood water used. Although numerous properties of flood water are known to be favorable or detrimental to an efficient flooding operation, the exact properties of an ideal flood medium are yet to be determined. The main difficulty is the lack of information on the nature of the solid material, principally of the clay material in the sands. Those clay materials represent a high percentage of the surfaces which control the movement of the fluids in the sand.

Clays are subject to hydration and base-exchange reactions. The properties of flood water have a great effect on these characteristics of the clays; and, if not controlled properly, can cause a swelling of clays. The nature of swelling caused by absorption of water into the micelle, or an envelope water between clay particles, interferes with the passage of the fluids through the sand.

Effect of Flood Water Composition

Cleaning action by flood waters can remove deposits from the sand face of input wells, thereby increasing intake rate as well as production rate. The removal of oxygen from a flood water at one lease resulted in an appreciable increase in intake rates, as demonstrated in field examples. Changes of the pH value of flood water between the limit 8.5 and 5.8 had no noticeable effect on the behavior of input wells.

Well Equipment Adequate

The amount and types of input-well equipment which can be used to help maintaining and increasing water-injection rates are more than adequate to do a good job. The amount and types that actually are used are dependent upon the balance between economics and the desire to operate and flood efficiently. There has been, and no doubt will continue to be, an ever-increasing interest in equipment to maintain injection rates, and many new ideas have come from recent laboratory and field experiments. Suffice it to say that an adequate means of access to the surface connections of a well for control and testing purposes, without disturbing the input well, and a proper allowance for the servicing of the subsurface equipment and sand face in the late years of the well life, will greatly benefit the producer.

Chemical Cleaning Helps

Due to the method of equipping input wells, efforts to clean the intake surfaces and well bore as a routine operation are limited in effectiveness, and have not proved highly successful financially — although there are many cases in which individual wells have shown marked improvement in intake following such efforts. The use of acids and alkalies has increased intake rates when used in conjunction with some mechanical cleaning. On various occasions improved intake behavior, due to remedial methods at the water-input wells, has been achieved; but it would appear that preventive methods, such as the provision of a clear, non-aggressive, non-encrusting, and possibly sterile water is a more effective method.

Val Verde Well Deep

Texas Co. continues to drill on down at a depth of 6772 ft. with Malis No. 1 explorer in Sec. 10-4n-17w in the Val Verde area, Los Angeles County.

Beach Well Gets Ready

Henry Carten is planning to drill DuBois No. 1 in the townlot area of Huntington Beach. Well site is in the vicinity of 18th and Orange streets.

Kern County OIL NEWS

UP FROM SAN FRANCISCO and up from Los Angeles came stabilized commuters of industry as summer went away and autumn came so FAR behind. Three-fourths of the year is gone, but the summer even in this October lingers on. It is still hard to say "up from San Francisco".

LOTS OF ACTIVITY continues because there has been a lot "drilled up" and the demand is ferocious. Business is great and beyond being good. Taxes are excusable. There have been population increases. Oil men are in a good mood in Kern. With demand up over 52% of what it was in 1941 and the end not in sight, why shouldn't everyone be happy?

AS OF THE CLOSE OF BUSINESS at the third quarter's ending the income from oil will far exceed that of agriculture, although oil took an awful beating last year. Still "FIRST IN OIL," however, as four other counties beat Kern to a proud shout, "FIFTH IN AGRICULTURE" state and nation.

BARNEY BARNARD from the local Conservation Office is an ardent fan of the great American sport baseball. His "kids" have inherited it. And then one day last month as he was coring **us the "click"** that makes the industry go around on MER's . . . the "Dodgers" made a run and so did Barney . . . then and there . . . the operator didn't have to tell me that we had been disconnected . . . we had been all the time . . . even before the score.

PAUL J. HOWARD was catching up on magazines that piled themselves high on his desk the summer long. He told us that Clem Hodges from the Assessor's office went to work for Richfield as scheduled and that JOSH HANKS will announce his successor (Hodges', that is) on pressday for "COW" October 15.

ERNIE E. PYLE now with Jergins Trust has already signed his name "VP" and Assistant General Manager so they say around Bakersfield. Great "guy".

MAX NEWTON and Doc Stockton (of the history making Stockton dynasty) were class mates at University of Nevada. Max went to coaching for KCUH and later to Kettleman with his own Drilling Contracting business. Dr. Stockton went to practicing medicine and flying as a hobby. One day last month an old familiar pain hit Max but he summoned Doc right now. And in a self diagnosis on the phone it was apparent 'something busted'. To Kettleman flew Dr. Stockton . . . picked up Max and flew him to an operating table. In quick time he operated, fixed Max up, and flew him back THIS IS WHAT WE CALL A PAL.

N. van WINGEN, petroleum engineer for Richfield at Elk Hills, is now "Professor Van". To University of Oklahoma last month went Van to teach petroleum engineering. Continued and unlimited good wishes, Van.

AND CHARLIE DODSON did almost the same thing. He resigned from Standard and went to USC to do something there about petroleum engineering.

ONE SCORE AND several years ago SUNRAY invaded California. Joining with Royalty Service at Long Beach Sunray soon branched out to Santa Maria and acquired Bell Oil and Refining. Now merging with the Getty group Sunray will take in Pacific Western by purchasing the family stock for cash. But this is not all "Pac Wes" owns 9% of TWA (Tide Water Associ-

KERN COUNTY'S "QUEEN FOR A DAY" IS CROWNED IN OIL: Lillian Power, "Queen for a Day" selected over a national network visited Kern County last month. While there "Brownie" Brown of the B & B Oil Tool Company with his "oil well tool cleaner" fashioned up a beautiful crown to replace one Queen Lillian had lost while flying over oilfields around Taft.

ated, that is) and 47% of Mission Oil Corporation, which owns 60% of Skelly and 21% of TWA. This stock will be put on the open market according to our operator. But to end the story . . . SUNRAY-SKELLY will be the new name and operate out of Los Angeles the M/O facility. Kern County is excited . . . quite naturally.

AT WASCO, CALIFORNIA only one field remains . . . all others including the famous Continental Well the world's deepest producer have been abandoned. Only Soco Mushrush exists and that by sheer accident or error.

HORACE PIERCE of Standard Oil one day more than a decade ago got a telegram from his chief in San Francisco. In substance and in part it said, "contact unimportant parcel section, so and so Wasco." Horace called at a farmhouse where distress was so manifest he took leave to call at an opportune time. Since he was the savior of distressed farmers he was welcome and he signed, sealed and delivered a lease. Hot wires returned from the H/O since the figures did not jibe as to section, range and township. But it was too late . . . the deal and show had to go on. TODAY this is still a black gold mine despite some slump in production and water trouble. But nevertheless the story is true and it is good. The lease H/O intended was somewhere in dryhole Lost Hills area. . . . Another unreal reality and a Ripley for sure.

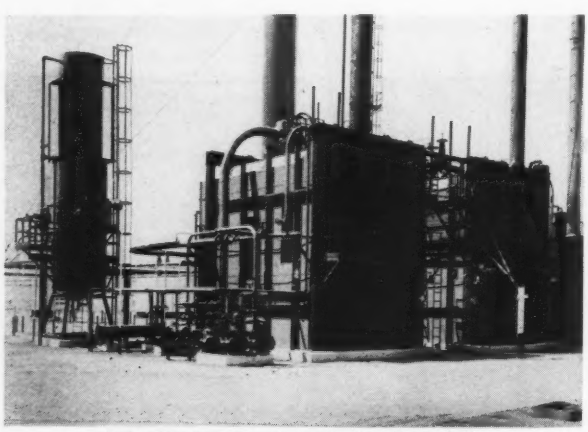
HARRY GODDE is still with Signal as chief geologist but we see him seldom around these parts . . . perhaps he stays at the Inn instead of the El Tejon and its Oil Zone.

"THE BUSINESS OUTLOOK" as published monthly by Wells Fargo Bank and Union Trust Company of San Francisco gave Kern County special recognition in Petroleum production. "Substantially larger than prewar production, ranking first since 1943 with Los Angeles second," **Kern County is taking a five year lead.** (Underscore is ours.)

SPEAKING OF WELLS FARGO BANK, it still has a "Buy A $1000.00 On Easy Payments Plan". Twenty-two years ago the old Hellman Bank in Los Angeles had such a savings plan when everybody was going haywire with installments. Credit of $4.42 was given (or $2.21 if one could only afford $500.00) as interest earned at the end of four years providing one kept up the payments

PERSONALLY WE THINK the trip made by San Francisco Stock Exchange is paying dividends. A member of the Wells Fargo Bank was on the **junket** and already we have a good story, which was one of the reasons for the trip as we have said many times, "to get more story minded financially about oil, oil securities and oil sources."

SACRAMENTO COUNTY is the second largest gas producer with Los Angeles second. Solano County is also important as a source of natural gas. However, ARTHUR DUDLEY will be happy to have us admit that Sacramento is the highest from standpoint of value of gas. But wait a minute, this is Kern County Oil News, not San Francisco or Sacramento . . . "yarns about oil drips and gas."



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GLENN HENDERSON who used to be in Taft a lot, and seen over in Bakersfield occasionally, was recently a visitor to Kern County. Glenn will always be one of the pillars of the industry.

DO YOU REMEMBER "Deepwell" Chuck McKee? . . . well, he is back in Taft in the oilwell supply business. On account of being on Main Street, right down there around automobile alley we couldn't figure out just what was cooking. Soon as we know we'll sputter a line or two . . . meanwhile we are calling on his brother Gillis who now owns the Bakersfield Pipe and Supply Company out on North Chester, maybe we can find out something.

NATIONAL SUPPLY COMPANY would not admit it officially but we see too many of the local officials pointing at it to not believe that a new long earned building is being constructed. The foundation is shaping up and we hope to have a story for **"COW"** come next issue.

"LOS AMIGOS," a dance club started here in 1937, held one dance each month on the second Saturday night. A fortnight ago Colonel Frank Hornkohl, oilfield chemist, told us that almost everyone who belonged then are now in Southern California and that so many of them were available the club composed of mostly oilwigs is now holding its monthly dance the third Saturday of every month at the Pasadena Athletic Club from October through May.

BY THE BY Frank Hornkohl has a new laboratory coming up at Truxtun and Q Streets . . . the "Q" is for 714 . . . but when? . . . Frank did a good job as Colonel and also as a pianist . . . even as our great leaders have in their vocation and avocation. . . . Our application for a commission in World War II stressed the importance of having a hobby and "mixing."

JOHN M. MADDRILL, tax department GeePee, is always interested in the best value for the tax dollar. Recently he gave us a lead that might be passed on to the chambers of commerce in the county . . . a brand new idea in frozen food . . . something different.

WILL J. SIBLEY, deputy director, Department of Justice, State of California, at the capital is genuinely interested in OIL, the great resource of Kern County. Among subjects of discourse recently was representation by increased authority of areas and counties provided with the enabling act that permits making known their resources with tax dollars. It is possible that legislation will increase the number of executives empowered or authorized to do so. This is the real kind of research the counties have been looking for.

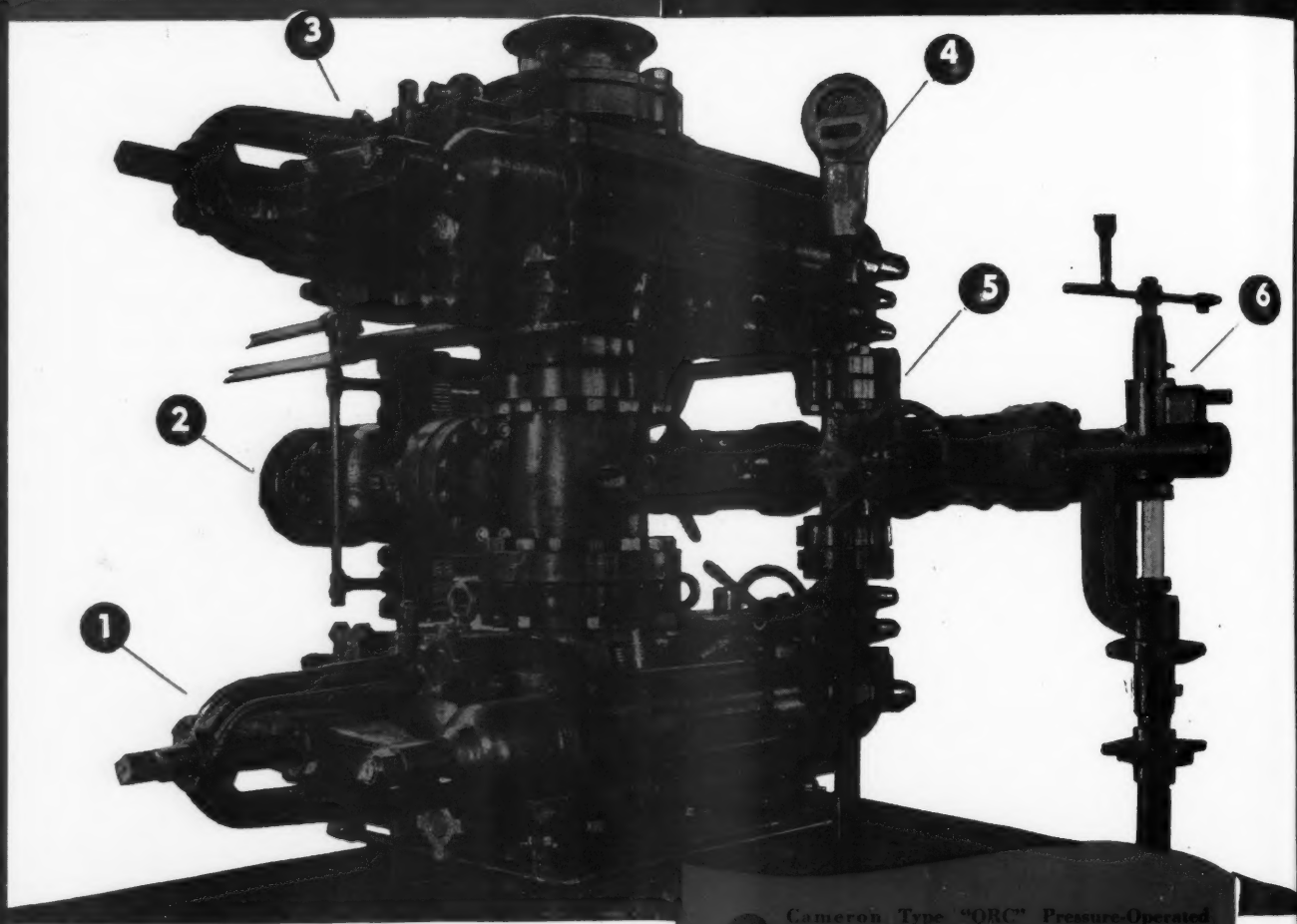
TELEFILM OF HOLLYWOOD favored the oil industry recently by sending up suitable assistance in filming the area including some of the 11,000 and more oilwells. Mr. Ellis McPherrin Yarnell was the kind gent at the focusing machine. He took 2600 feet of color.

FROM SHAFTER at the recent County Fair came JACK HARE, Inc. with Jack in person who handled the magic wand for Shell Oil Company . . . at least a part of the time. No wonder there were no flies, no mosquitoes or ugly bugs.

RALPH BAKER IS A NAME TO REMEMBER too, since he is the man with the all rubber battery. He represents a Kern County patent and is the manufacturer of Kurth Batteries, Inc. Said he, "oil men understand when we have the best, and it is the best." He took orders totalling over 1000. THIS is only one reason for fairs and expo-

OIL FEATURED MANY AN EXHIBIT AT KERN FAIR: This year for the first time in the history of Kern County's many successful fairs mining exhibits as designated in the State's backbone premium list was given a choice position of entry. Nearly $2000 was collected by mineral exhibitors . . . Now the oilwigs are asking that oil and petroleum products be featured next year . . . particularly since Kern is FIRST IN OIL as shown in the county exhibit booth. The foreground is a miniature railroad depicting the famous Tehachapi Loop . . . to scale.

CAMERON 6 POINT DRILLING CONTROL



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4. Cameron Mud Line Pressure Gauge to provide accurate and easily-read line pressures while bleeding off well pressures thru the choke manifold.
5. Cameron Flex-Seal Mud Line Valves to assure dependable operation and pressure-tight closure should it become necessary to bleed off well pressures.
6. Cameron Type "D" Flow Wing with built-in valve and specially hardened, easily replaceable, flow bean to provide the final measure of *well control* while bleeding off well pressures.

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sitions.

HOWARD C. BROWN of B & B Oil Tool was a happy person one day a fortnight ago when he was able to re-crown the "Queen for a Day". He heard someone say that she, "QUEEN LILLIAN", had lost her crown flying over the oilfields. So he came "tumbling after". It was a perforated affair and someone suggested it be a matter of reconditioning or replacement. Brownie came through with perforations and all and even thought it was a good idea himself. What is more he represented the oil industry in his kindness which made publicity and something big happen to the industry in publicity, as well as to himself.

FRANKLIN D. SCHMIEDEMANN, well known to Kernoilwigs, is at the St. Moritz Hotel in Hollywood . . . general manager . . . he opened the El Tejon and the Taft Apartments several years ago. He was seen milling around the Fairgrounds recently and all the Petroleum Production Pioneers knew him.

FEATURED THIS MONTH here and there is the GENE REID DRILLING INC. story which is partially told under cut caption headings. The story really deserves a separate treatment because it is a "success story". It is a story that most of the rest of the world does not know, and in some countries could not accept. It is a story of reward for extra effort which has helped hundreds of homes and made hundreds of persons satisfied with the American enterprise system . . . and no one has been injured, jailed, or had his rights separated from him. He has even helped foreign countries.

TODAY GENE REID looks with hope ahead. He believes the California Oil Well Drilling contracting will continue to be a rapid growing industry. He is prepared to maintain a high standard of equipment and workmanship for that reason. He already is held in top flight esteem and recognition.

ROCKET PETROLEUM COMPANY with ten producing wells to its credit, and the Gene Reid Exploration Company, an organization formed for wildcatting and general explorations, are also operated from the main office on Pierce Road. This effort is Gene Reid's part in an attempt to maintain logistics to obtain new production and new oil which the country as a whole needs. It's a far cry from a rotary helper in the days of the first world war.

DIRECTLY OPPOSITE the Rocky Mountain Drilling Company on the south end of Pierce Road is the GENE REID DRILLING INC. Five acres of land comprise the parcel on which the new home concern is located. The plan was designed by Reid and it fits the drilling contracting needs.

CHARLIE LAKE IS returning from an eastern trip to New York and Canada. So well did he like New York that he brought back a car by the same name almost, a "New Yorker". While away Western Oilfields Supply Company readied itself for two things: more room to store supplies and more time to make up new pipe. Incidentally, we like the new sign, that highway bulletin to be precise, just after we leave Gorman's. . . . Bovey was telling us it brought in an order for some rental pipe. Bovey also

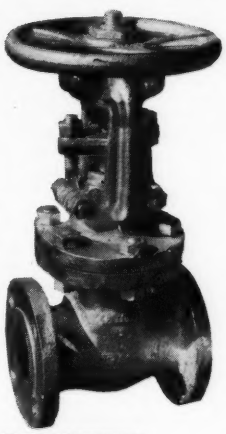
HARD FACING of VALVES

a SPECIALTY at JOHNSON

Long known in the oil industry for expert, reliable work in the repair and maintenance of all types of valves, Johnson now adds another important service . . . complete facilities and trained personnel for hard-facing of plug valves. The newest equipment, operated by highly skilled technicians who SPECIALIZE in valve work, assure service that can be depended upon.

* * *

Every man at Johnson is proud of the Johnson reputation.



"ALL WORK GUARANTEED"

Johnson VALVE SHOP

BAKERSFIELD PHONE 2-5266

Dependable, Low-cost Conveyance for OIL and GAS

UNIFORM WALL THICKNESS is one advantage of Calco Welded Steel Pipe . . . Skelp from which Calco Welded Steel Pipe is made is held to very close tolerances. You can depend upon uniform wall thickness in the finished pipe and the entire line. No threads to weaken the metal at the joints. Long lengths, light weight and high flow capacity are some of the other advantages you will find in Calco Welded Steel Pipe.

ARMCO DRAINAGE & METAL PRODUCTS, INC.

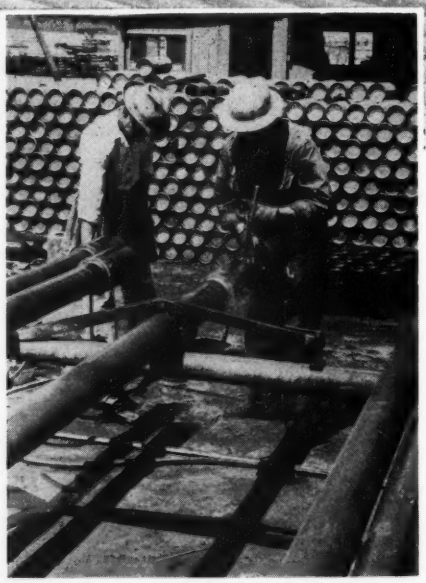
CALCO DIVISION, 2614 Seventh Street, Berkeley 2, Calif.
423 LeRoy Street, Los Angeles 12, Calif.

WOSCO DOES IT!

TOOL JOINT INSTALLATION on new and used drill pipe is big business in WoSco's Bakersfield Pipe Yard. WoSco's rail siding, power loading equipment, carefully planned layout of pipe racks, and latest shop equipment make it easy for WoSco's pipe specialists to quickly install or change tool joints on any size or type drill pipe. Complete facilities and years of experience will save you time, effort, and money at WoSco.

WOSCO: **Supplies** pipe for every oilfield need
Repairs and reconditions used pipe
Fabricates oilfield conductor pipe
Rents and installs rental pipelines and pumps
Installs all types of tool joints

Whatever your pipe needs . . . . WOSCO DOES IT!



WoSco has teams of thoroughly trained technicians who have installed thousands of sets of tool joints of all types and sizes. The right equipment and years of experience assure quick, expert, and inexpensive drill pipe service at WoSco.

PIPE MERCHANTS

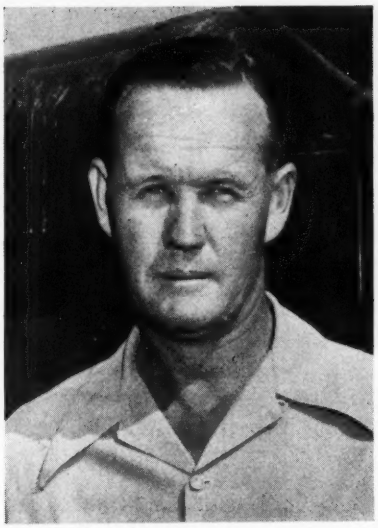
PHONE 6-6724

HIGHWAY 99 AT PIERCE ROAD—BAKERSFIELD, CALIFORNIA
HIGHWAY 99 AT DIVISADERO—FRESNO, CALIFORNIA

WESTERN OILFIELDS · WOSCO · SUPPLY COMPANY

WESTERN OILFIELDS SUPPLY CO.

PRESIDENT E. C. "GENE" REID of the Drilling Company by the same name, GENE REID DRILLING INC. Once Gene was a ruffneck for Interstate Oil Company of Maricopa on a rotary and came up the hard way with hard work for which he has been rewarded. Gene was in World War I but when he came out he went right back to the oil business and made his first big promotion as superintendent for the Termo Company of Long Beach. He has had a large amount of experience in Texas when he was with Taft Well Drilling Company. "CONTINUED UNLIMITED GOOD WISHES FOR GENE AND HIS SPLENDID CREW."



THE VICE BRASS HELMET of the Gene Reid Drilling Incorporated, is R. L. "Bob" Barnett who signs as Vice President. Gene calls him the General Superintendent and commends him for his conscientiousness and loyalty many times during an interview. He credits satisfactory operation of field equipment and personnel to Bob.

AND HERE IS BILL KINNEY himself to back up what he told Gene Reid and Bob Barnett about his efficient staff . . . out at Gene Reid Drilling Inc. You wouldn't doubt it would you after looking over the determination on Bill's face . . .

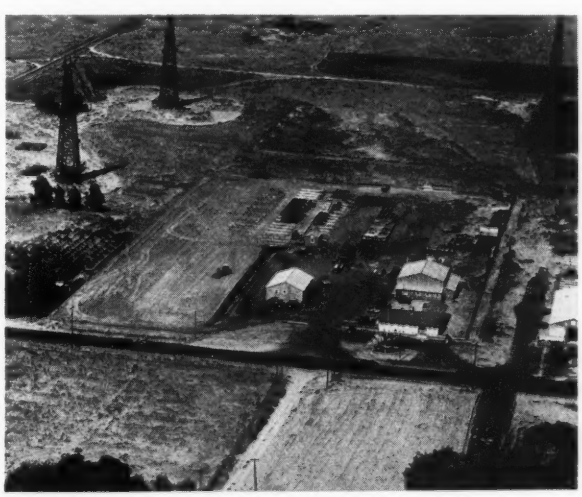
told us that Lake's trip was largely a business trip and that he was the official buyer for the firm, never failing to bring back something very useful around the oilfields.

HAVEN'T HEARD FROM JOHNSON VALVE this month . . . must have gone on an extended trip. See lots of activity over at the shop and somebody is still using a heck of a lot of valves, it seems to us.

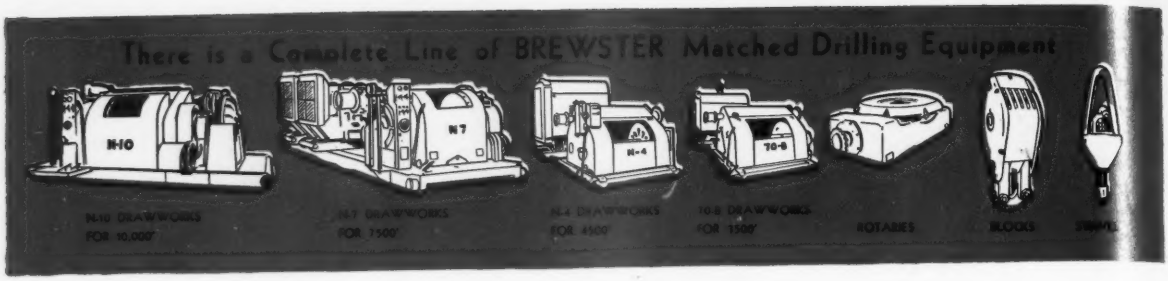
CAUGHT A GLIMPSE of Harry Phoenix of the OILFIELDS TRUCKING COMPANY, at the Horse Show during Fair Week. We always thought Harry started with gas engines but maybe it was horse's power. Anyway he was under the big top looking over some prize beef at $2.00 per pound and not the least bit interested in lamb which brought $22.50 per pound. Harry is more interested in Black Top, the kind that goes on roads which he is building all over the country.

HARRY CROSSAN, vice president and general manager of the Kern Bank, postcards from Boston that he will return shortly from his trip to Harvard where he went to see his son Jimmy get married. Wedding bells have now rung for both his boys, but Harry still looks like he wasn't old enough to be

JUST WHAT THE DOCTOR ORDERED: Out at Gene Reid Drilling Inc., Leo Adams, Leona Ferguson, and Wanda Whitlock help make up the efficient staff that W. E. (Bill) Kinney has been shouting about.



GENE REID DRILLING INCORPORATED BY AIR: On Pierce Road's exclusive area is located Gene Reid Drilling . . . a plant that may well be a model for the Drilling Contractor's Needs of California and Kern County.



BREWSTER Matched EQUIPMENT
...with a 37 year pedigree!

The BREWSTER OB-12-S Oilbath ROTARY

Here is the most popular compact rotary on the market. It features a 29" dimension from center-line of table to center-line of sprocket. Full 12" table opening. Steel skid-bed. Ball bearing table with oilbath lubrication. Two sets of tapered roller bearings take all loads on the pinion shaft. Ring and pinion gears run in oilbath. Slushproof bearings and oil reservoirs. Fast, positive table lock on table skirt.

Also available is the Brewster OB-12-L Rotary with extended pinion shaft and having a 44" c/1 to c/1 dimension. There are four other types and sizes to meet any rotary need.

Brewster Rotaries have proven they can take it. Day after day. Well after well. Write today for your copy of our new catalog showing the entire line of Brewster Matched Equipment.

BREWSTER HOOK BLOCKS

Compact and short coupled for use with portable rigs and short derricks. Roller bearing sheaves. Hook of Chrome - Nickel - Moly steel swivels on roller thrust bearing. Model H-50 capacity 50 tons. Model H-90 capacity 90 tons.

BREWSTER 3-S SWIVEL

Streamlined body provides large oil reservoir for oilbath lubrication of the three tapered roller bearings. The Model 3-S with a capacity of 50 tons, is only one of four Brewster Oilbath Swivels with capacities from 50 to 300 tons.

Export Sales: BAIRD SUPPLY CO., INC.
420 Lexington Ave., New York 17, New York, U.S.A.

The BREWSTER CO. Inc.
Manufacturers of Drilling Equipment Since 1910
SHREVEPORT, LOUISIANA, U.S.A.

BREWSTER
Drilling Equipment

"grand-dad" for a long time. While away FRED OWEN of the Ethel D served on the loan committee. No loans were made.

CHARLEY MANLEY makes news again for himself as well as for Kern County and the Oil Field Construction Company. This time nature took an important part. As the 12th annual Sextette fishing trip time arrived, Charley with five cronies . . . and he never trades old friends for new . . . took off for the high reaches of the Kern River. This year he broke precedent and passed up the Quaken Aspen country for the first time. Instead, he took a circuitous route with eight pack mules and headed up for nine hours until he came to Hell's Hole on Kern River. Owen Rutherford had packed the crew well to permanent camp . . . for an eight day trek. Leaving permanent camp they took off to Kern Flats and here was a sight. **Four dead motors** and **four dead planes.** One airplane was in the river. The field is now closed and Airplane Flats is looking for a plane that can "take it" like they used to a decade or so ago when nobody ever cracked up.

MANLEY'S 12TH ANNUAL FISHING TRIP was loaded with some powerful oilwigs. Warren Johnson, top Standard Oil Superintendent, Frank Tolf of Soco's Maintenance Department, and his son Mitchell from the Engineering Department, Eddie Winterstein, foreman from Taft and Bill Collins in the organization department. None of these men will attempt very soon to fly anything but bait for Rainbow. In fact one of the boys thinks he will develop a plane to take 9000 feet and like it.

STORK ARRIVALS: Herb McMasters, a boy, Thomas Owen. Walter Matjasic, a girl. All from Honolulu Oil Corporation

FOR THE NEXT TWO months the Bakersfield Californian will have a high class photographer on the spot in your office to re-morgue your mug. Let them in for it is a good deal. Too many of our oilmen are being shown with 1910 features . . . so much so that the head driller on the Lakeview 1910 looked like his great grandson at the Rio Bravo school and the kid received a lot of letters commending him for his skill in shutting off the fire which the kid never even heard about.

SIR ECHOES OF THE "CNGA": As we remember them and could see them: Jack Harris, SOCO at Wasco; Harmon Pheahl, SOCAL Gas at Taft; Gordon Greene, GAS & OIL EQUIPMENT CO; Dave Stocks, RICHFIELD; Larry Carlson, ACCORDIONIST; Roya Snyder, COAST COUNTIES GAS; Frank Colton, T.W.A. Co., Los Angeles; (CNGA Chairman) George Howells, TWACO. Belridge; H. L. McCarty, UNION OIL, Bakersfield; L. P. "Spike" Foote, OHIO OIL CO., Coles Levee; and Ross Furlong, TEXAS COMPANY, Fellows, (Secretary Taft Chap.)

PUMICE BLOCKS for that oil-well exhibit, the backyard barbeque for operator, driller or producer and ruffneck. A Kern County product seen now on almost anything but an oil lease. Oilmen are using them to make up a wildcat office . . . light as a feather, they can be moved from wildcat to wildcat with the little finger.

GOLDEN STATE CAR AND IMPLEMENT COMPANY attracted the oilmen of Kern recently as JIMMIE OWENS was able to make delivery on some very special transportation. Jimmie got his start in Taft and has been in high gear ever since with the oilmen around the county.

CHARLIE SHERTZ used to be in Taft with Standard but he moved to Bakersfield and was still with Standard. Now we see his rancho every day and when we stop we always see our oil friends out there buying fresh tree ripened oranges to send back east in time for Xmas. By the way we heard that they are going to have **that** again this year. **Xmas.**

OILDORADO at Taft was a dilly. Old timers night at the Petroleum Club was well worth the money. Harry Hopkins was there. . . . Raymond Grey played the piano and county supervisor Andy Noon did his hospitable part.

MORE ABOUT THE TAFT OILDORADO PARADE reminds

WAX -

FINE IN CANDLES
A HEADACHE IN OIL LINES

Nobs Wax Solvent will dissolve and remove the most persistent waxes and paraffines from wells lines and traps.

NOBS DEHYDRATING CORPORATION

2465 East 53rd Street, Los Angeles 11, California

New!

THE McDONALD

FOLD BACK FACE-GARD

FITS "T" and "P" HATS

FOLDS BACK WHEN NOT IN USE

Provides both eye and face protection—standard size, 6 inches long—also available in 8 and 9 inch lengths. Made of clear or green cellulose acetate, available in .040 gauge.

WRITE FOR BULLETIN AND PRICES

B. F. McDONALD CO.

Manufacturers & Distributors of Industrial Safety Equipment

Safety FROM HEAD TO FOOT

5100 P SOUTH HOOVER STREET
LOS ANGELES 37, CALIFORNIA
Other Offices in San Francisco & Houston

us of the Tracy guy from Buttonwillow and his bronze overalls, anvil and hammer that is a treat in old Madison Square's Garden. Even Village Blacksmith Tracy himself was bronze . . . he used to do that to his horse but it's his turn to get off and let the horse ride. We haven't seen the judges decision but the grand sweepstakes, we'll wager is his'n. (Tracy of course.)

OLIVER IMPLEMENT COMPANY'S Charlie Elwood told us this month that his firm is still handling a complete line of crawlers, and motors and other gadgets for the oil industry and that his exhibit at the fair interviewed people who thought we should know about it. This kind of news went out in 1890, but so many oilwigs know Charlie it will do no good but no harm to editorialize him a little bit.

GLAD TO SEE JOSH HANKS take in the Assessor's Association meetings and here is hoping (say all the Taxwigs and Oilwigs of Kern) that he can attend the National Association of Assessing Officers (NAAO) at Miami in the Flamingo Hotel December 1 to 4. Josh is Kern County Assessor, in case we have forgotten to tell you.

S. W. SELFRIDGE was recently introduced to us as Soco's new oil rights of way tax consultant.

CNGA TAFT CHAPTER is giving up its meeting currently for more emphasis on the big show down South.

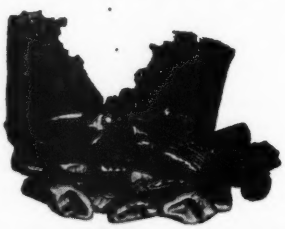
ERNEST ELLERY, who has noted some improvement in parking recently at the El Tejon, is standing by for an aerial shot that will sweep one off his feet. Promised last week to us . . . one extra good shot of it.

OCTOBER'S HUMIDIFIED WARM RAYS from Sol spelled summer for Kern, and oilwigs declare that finally and at last their calendars will be changed to read "September 1, Summer Begins". It really is not so bad to make excuses in June, July or August but for September the passing tourists are convinced that summer is perpetual the year round.

ALL OF WHICH LEADS US UP TO Ernie Pyle. The current Readers Digest for October carries

Don't Knock Yourself Out

. . . trying to get this sort of junk out of your well!



(Below) An assortment of Metal Junk

(Above) Rubber Sleeve, Slips, and Pieces of Body of Bridging Plug

Any loose and movable junk can be recovered easily with the

CAVINS HYDRAULIC SUCTION FISHING TOOL

Phone the nearest representative for sudden service . .

THE CAVINS CO.

LONG BEACH
2853 Cherry Avenue • Phone 485-64
VENTURA
1641 No. Ventura Ave. • Phone 6767
SANTA MARIA
Phone 1210-L
BAKERSFIELD
1120 33rd Street • Phone 6-6860
TAFT
204 Center Street • Phone 1127

a lovely story on page 168 from "Home Country" as follows: "Sure, it has spots I don't like. (Speaking of California.) You couldn't hire me to live in agricultural Bakersfield, nor in far north Eureka, nor in the sham of Hollywood. But you don't have to live in those places." THIS IS WHAT THE PIONEERS THOUGHT TOO EVIDENTLY, WHICH MAY HAVE STARTED THE MANY PUBLIC SERVICES AND RELATIVE TAXES ON DIMINISHING RESOURCES . . . SOMEONE HAD TO DEVELOP THEM AND GET PUBLIC SERVICES TO HELP.

DOWN WENT THE MERS as quotas posted for September read 859,700, October 850,600. Adjustments in various methods of production at Coalinga and Kettleman given as reason.

GREELEY is getting together for a gas lift as you know. The daily there was upped from 8900 to 13,000. The latter figure may be okey if the engineering principle involved is worked through the committee, according to our conservationist.

BUENA VISTA HILLS 27 B pool is over, but because of some disagreement as to the capacity the field should produce. A gas lift is being planned.

McKITTRICK area is not correcting itself very much if any in some areas with a run up average totaling 6000 B/D. The situation is pretty hopeless they say.

GOING BACK to BHV four of the majors have agreed on one thing not to increase any . . . which helps to the tune of about 3000 b/d.

SAN JOAQUIN VALLEY is reported over 56,000 b/d with Wilmington's 21 and ¼ thousand per day over making up the State's 77,840 b/d excess of the gentlemen's agreement and MER's.

SO MUCH FOR THAT . . . some of the companies which have tried to improve their position and have, have taken after your scribe for not relating improvements. Fair enough . . . will do.

BILL CUNNINGHAM of Bishop Oil is no longer a bachelor and housekeeper. Mrs. Bill who has been in Honolulu with Pat where her father was seriously ill has returned. She made the trip by air and reports that her father is much improved. Mike and Joe were mothered by Bill and were glad to see their mother indeed.

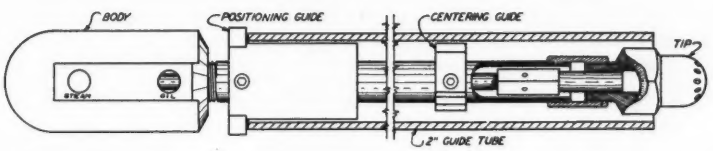
BISHOP OIL by the way has been up in Kirby Hills near the Rio Vista . . . Cunningham reported that Charlie Brown, super mud sales man, who used to work for Charlie Lake out at Western Oilfields Supply (WoSco) held open house during the world series with all that goes with it for free. Everything except the wagering incredients.

WANTED

Wanted producing oil and gas royalties. Private investor, Box T, c/o Calif. Oil World 10/20d.

SMITH - EMERY CO.
Since 1904
Oils Tested
Shipments Certified
Tanks Strapped
Offices and Laboratories
929 Santee St.
Los Angeles

JOHN ZINK'S STEAMIZER TYPE



-MTB OIL GUN-

Burns Any Properly Prepared Commercial Grade of Fuel Oil

FEATURES:

1. Gas or steam atomization of fuel oil or sludge.
2. Short flame at low excess air.
3. Low steam consumption.
4. Equal flow from all tip ports . . . uniform flame.
5. Vertical or horizontal firing.
6. Low fuel oil pressure required.
7. Gravity feed for moderate duty.
8. Easy to clean.
9. Extreme simplicity of design.

WRITE for LITERATURE

JOHN ZINK COMPANY

4401 South Peoria **Tulsa 1, Oklahoma**

Representative: S. G. Higginbotham, 403 W. 8th St., Los Angeles

Questions & Answers

about the NEW Shaffer Type 46 Combination Rotating Blow-out Preventer and Stripper

BECAUSE IT is so complete, so adaptable, so trouble-free in all types of pressure control operations, operators everywhere are asking for more information about the Shaffer Type 46 Combination Rotating Blow-Out Preventer and Stripper. Typical questions include . . .

"DOES IT REQUIRE SPECIAL STRINGS OF PIPE? *We like to simplify our operations and inventories as much as possible and are wondering if your unit requires flush joint or other special pipe."*

NO! The Shaffer Type 46 Combination Rotating Blow-Out Preventer and Stripper requires no special drill string equipment of any kind. It packs off around *any* type of pipe—coupled, upset or flush—with equal efficiency and safety. What's more, it maintains its leak-proof seal *continuously* while any type of pipe is raised or lowered through the unit!

"WHAT OPERATIONS ARE NEEDED TO PACK OFF THE UNIT? *Pressure emergencies happen fast. What operations are required to seal-off against pressure leakage around the drill string?"*

NONE! The Shaffer Type 46 Combination Rotating Blow-Out Preventer and Stripper is *always* packed off while the drill string is in the hole. No matter how sudden the pressure emergency, it can't be too fast for the Shaffer Preventer *because no operations whatever are needed to place it in operation!*

"CAN BITS AND REAMERS BE PASSED THROUGH THE UNIT *with maximum ease, safety and simplicity?"*

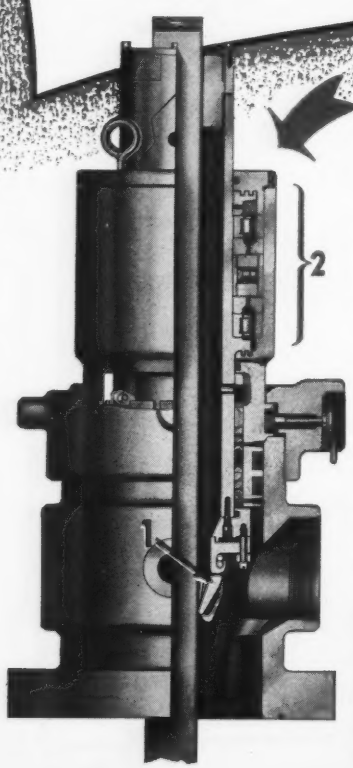
DEFINITELY YES! Just pull a latch, rotate the Bonnet 1/6th turn and the entire internal mechanism rides out on top of the bit or reamer. Simply reverse the operation when going back into the hole. It's as easy as that—*and as quick!*

"HOW ABOUT THE KELLY? *Is a special kelly needed to keep from damaging the sealing rubber?"*

NO SPECIAL KELLY IS NEEDED with the Shaffer Type 46 Combination Rotating Blow-Out Preventer and Stripper. You can use a square, hexagon or octagon kelly—whichever you prefer—and the *same* unit seals as effectively around each type. What's more, because the Stripper Rubber rotates *with* the kelly—not around it—there is virtually no wear on the Rubber while drilling. Cuts maintenance, assures better pack-off and a maximum of trouble-free safety!

. . . and note these features

There are many other unique advancements incorporated into the Shaffer Type 46 Combination Rotating Blow-Out Preventer and Stripper of which the following are typical . . .



1. EXPANDABLE STEEL BARRIER PROTECTS RUBBER. Note how the Stripper Rubber is protected by a barrier of steel latches that expands and contracts to permit normal flexure—but safeguards against extrusion or abnormal expansion.

2. ADVANCED BEARING DESIGN. Thrust and radial loads are carried on separate bearing assemblies, each specifically engineered for its particular type of service. In addition, the radial bearings are widely-spaced to provide ample resistance against wobble and gyrating loads.

These and still other unique advancements make the Shaffer Type 46 Combination Rotating Blow-Out Preventer and Stripper the most *efficient*, most *versatile*, most *positive* pressure control unit yet developed. Get *all* the details on this years-ahead control unit from your Shaffer representative. Or write

See pages 3454 to 3506 of the 1947 Composite Catalog for information on the complete Shaffer line.

Write for your free copy of the new Shaffer Catalog.

SHAFFER

HIGH PRESSURE DRILLING AND CONTROL EQUIPMENT • FISHING TOOLS THAT EXCEL

SHAFFER TOOL WORKS, Brea, California • California Service Shops: Santa Fe Springs and Taft
HOUSTON, TEXAS, 6006 Navigation Blvd. • ODESSA, TEXAS, 1925 West Second Street
OKLAHOMA CITY, OKLAHOMA, Acme Oil Tool Company, 1001 S. E. 29th Street
CASPER, WYOMING, Mountain Sales and Service, 133 North Wolcott Street
EXPORT SALES OFFICE: Shaffer Tool Works, 30 Rockefeller Plaza, New York, N. Y., U.S.A.

G. P. Adds Unit to Torrance Refinery

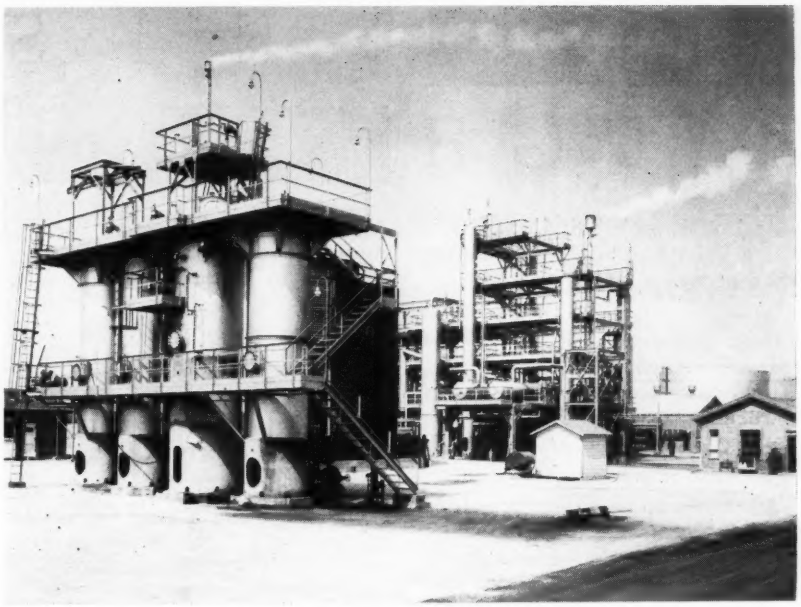
Another unit in the development and expansion of General Petroleum Corporation's Torrance, Calif., refinery was put into commission late in September when a nominal 5,000 B/D Edeleanu plant went into operation. Total cost of the unit and its appurtenances approximated $2,250,000 with construction and basic design features handled and supplied by E. B. Badger and Sons Co.

Concerning the new unit, Gale L. Adams, assistant manager of manufacturing of General Petroleum, said:

"Within practical limits every effort has been made to incorporate flexibility in so far as concerns types of charge stocks which may be successfully processed and also the range of solvent treatment to which each stock may be subjected. It might be added that the start-up of this unit was the most uneventful and smoothest from the standpoint of all phases of operation of any other similar event with the exception of the commencement of the Thermofor Catalytic Cracking units.

"In operations it is expected that the solvent to oil ratio may vary between limits of from ½ to as high as 2 to 1 with, of course, certain variations in the oil charge rate. Products which may be produced as occasion arises will range from solvents (both paraffinic and aromatic), kerosene, agricultural spray oils, and diesel fuels. Diesel fuel of 50 cetane number or higher as occasion requires will be produced.

"Among the basic design features supplied by the Badger company which might be mentioned are that on the raffinate three stages of SO_2 removal are provided whereas in the case of the extract four stages are incorporated. Such technical features of processing insure maximum recovery of the solvent on the one hand and, as a corollary, minimum retention of SO_2 in the product requiring added steps for removal. Needless to say, completion and operation of this modern solvent refining plant will keep General Petroleum in the forefront of the petroleum industry in the diversification and quality of its entire product output."



The G.P. Edeleanu Plant.

The Department of the Interior is giving the final touches to its hydrogenation demonstration plant in Louisiana and Missouri. These plants will delve into all angles of transformating coal into gasoline. These goals can be obtained, it is said, at a cost between 9 and 14 cents a gallon.

Johnston Stainless Welding Rods

PROVEN QUALITY SINCE 1931

•

A. P. JOHNSTON

1845 E. 57th St. - Los Angeles 11, Calif.

THIS LAUGH OFF!!

And in all probability a barber is just a lad who played with blocks when he was a kid.

Cop: "How did you knock this pedestrian down?"

Motorist: "I didn't. I just pulled up to him, stopped the car to wait for him to cross and he fainted."

After intermission, a man and his wife were returning to their theater seats. The man asked a lady sitting at the end of the row, "Did I step on your foot as I went out?"

Expecting an apology, the lady sternly replied, "Yes, you did."

The man turned to his wife, "Okay, Helen," he said, "this is our row."

A native of Brooklyn was spending his first day on a dude ranch in Nevada. He came back to the bunkhouse with a handful of rattles from an enormous rattlesnake. A ranch hand turned pale when he saw them and said, "Holy smoke, where did you get hold of those things?"

The Brooklynite couldn't understand the other's agitation; he explained, "I took them offen the biggest woim I ever seen."

A Scotchman, leaving his friend's house where he had been visiting, held out to his host's small son a nickel and a dime, saying: "Now, Sandy, which one will ye hae?"

Young Sandy (being a cute, wee beggar) said, "Ach, Mr. MacTavish, I was always taught not to be greedy, so I'll have the wee one."

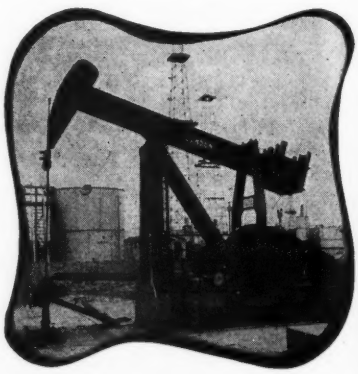
MacTavish replied: "Well, noo, Sandy, for being a guid bairn, and no' greedy, I'll gie the big one to ye."

And then, consider the preacher whose new car was sideswiped by another that ignored a stop sign and all other traffic regulations.

"It's my fault," said the other driver, "but there's nothing I can do about it. I ain't got a dime's worth of insurance. I'm broke and out of work. However, if it will make you feel any better you may call me any vile names you like."

Replied the preacher, "I'm a righteous man and my vocabulary contains no profane words of any kind. I have only this to say: I hope that when you go home tonight your mother runs out from under the porch, barks ferociously and bites you on the leg."

In one crowded Chicago night club recently an escort stooped to pick up his gal's glove and before he could straighten up a waiter had thrown a tablecloth over him and seated five people.



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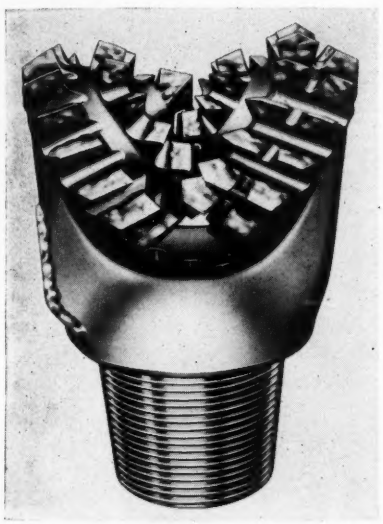
New Globe Rock Bit

The largest bearing area ever incorporated into a roller type bit, together with larger ball and roller bearings—these are features of the new Globe 2-Cutter Rock Bit which, according to the manufacturer, enable it to stay on bottom longer than conventional types, and therefore, continue to make hole while other bits are making round trips.



This new Globe Rock Bit is outstanding in its ability to make hole under the most severe drilling conditions. Cutters are designed to dig fast, and their long, well spaced teeth are constantly kept clean by the circulation, making them exceptionally efficient even in the stickiest formations. This feature is particularly advantageous when streaks of sticky shale are encountered which tend to "ball up" conventional bits.

Another feature is its ability not only to dig straight hole, but its uncanny accuracy in bringing a crooked hole back to vertical. It is used extensively for this special purpose, and in all instances has performed with remarkable efficiency.

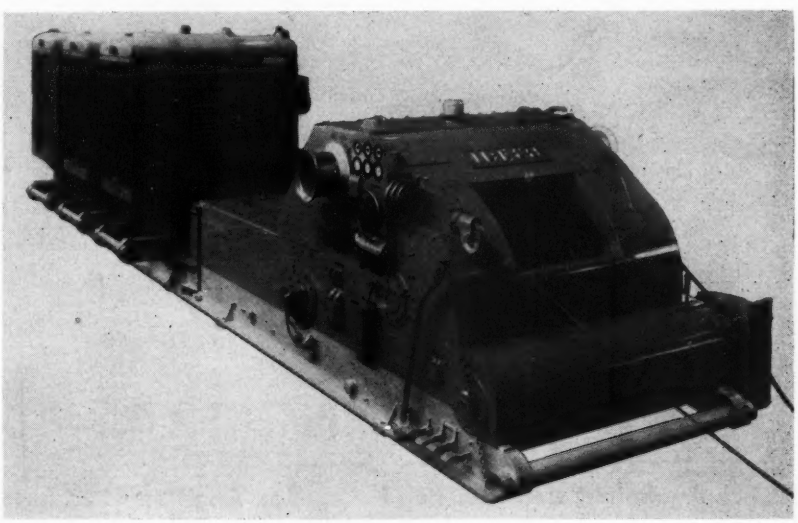
Geophysical drilling crews use the Globe 2-Cutter Rock Bit in the small sizes (4¼" and 4¾"), and it is a favorite with the party chiefs because it runs from top to bottom without changing, regardless of the variety of formations encountered. Furthermore, the extra large bearings help give it up to 60% more service life than other types.

It is manufactured in three different types: Type SS-2C for soft, sticky shales; Type S-2C for medium to hard shales and Type M-2C for hard shales. Further information may be obtained from Globe Oil Tools Company, Los Nietos, California, or any of its branches or distributors.

New Ideco Drilling Rig In Service

New features in rig design have been introduced in the advanced PR-600 Power Rig. Air operated friction disc clutches, inside spinning line cathead and use of the Hydrotarder are major innovations in this medium depth drilling rig.

With 600 H.P. input delivered through air clutches to drum and rotary, the rig is claimed to be extremely fast and smooth operating. Six forward speeds and one reverse speed are delivered to the drum and rotary. All forward speeds are selected by turning a single hand wheel. Speeds are chosen in any sequence without progressing through intermediate speeds—from low to high just as quickly as from low to second. The speed selector wheel operates air valves that allow the operation of only one speed at any one time. The valves automatically dump the air, releasing one speed, before air is raced to the clutches to operate the next speed. The air operated disc clutches allow speed changes to be instantaneously put into operation—even before the rotating parts have come to a standstill. Reverse speed is controlled by air with a lever located directly below the speed selector wheel. By moving the lever, reverse is automatically engaged when the rig is in any speed—even when the engines are at full throttle. In addition to speeding up the job the reverse acts as a safety device—any operation is instantly stopped and reversed. A pneumatic interlock prevents clashing with any forward speed. The control is automatic. When speed is disengaged the rig returns to the forward speed indicated by the speed selector wheel.



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The air operated friction disc clutches used on the PR-600 utilize special friction discs that operate efficiently even when oil is present. These discs are made of friction material developed especially for operation under severe conditions. Directly in front of the driller, and mounted inside the draw works case, is a spinning line cathead which is operated hydraulically. The line is led in by a guide roller, placed forward on the rig, which holds it clear of the operator.

An air-operated break-out cathead is mounted on the rotary side and a plain cathead on the driller's side. Catshaft operation is controlled by an air-operated disc clutch.

Another feature of the rig is the high-speed hydrotarder mounted inside the draw works housing. Considerable space is saved and weight is reduced. The hydrotarder is chain driven from the drum. Water level tank for the hydrotarder is placed inside and a single hand wheel at the driller's position regulates the water level. The water from the hydrotarder discharges into a sump mounted on the side of the rig near the driller. Simply by glancing at the discharge flow the driller is assured that the proper amount of water is passing through the hydrotarder system.

The brake lining is attached to the drum flanges and the brake bands are water-cooled. The circulated cooling water from each band is discharged into a sump in front of the driller, allowing a constant check of temperature and water flow.

The rig is powered by either two or three oil field engines connected to the compound through airflex clutches. The chain compound is entirely contained in an oil-tight housing and pressure lubrication to all bearings and spray to chains is provided. All bearings and chains in the tranmission and draw works, including the primary rotary drive, are pressure and spray lubricated.

Draw works and transmission, compound and engines are normally transported as a single unit. When it is required to travel within an 8 foot highway limitation the separate skidded engines are removed. The airflex disconnects make this a very simple operation. With outside catheads removed the rig measures 7' 11 15/16". When necessary, as for export packing, the rig may be separated between the transmission and compound by removing one chain and sliding out the connecting pins.

The PR-600 Power Rig marks a step in advanced design of the medium depth drilling rig—a faster, smoother machine, packaged within the eight foot highway limitations.

Bethlehem Enlarges Plant Operations

Bethlehem Pacific Coast Steel Corporation's new 50-ton electric steel making furnace — largest and most modern of its type on the West Coast—is nearing completion at the company's Los Angeles plant, according to an announcement by H. H. Fuller, President. It will virtually double the plant's steel producing capacity.

Mr. Fuller also stated that modern heating facilities for larger steel ingots which will be produced have been installed, also a new 32" blooming mill. In addition he pointed out, "Construction of a new wire mill is now under way." The new wire mill is expected to be completed by the end of the first half of 1948. The 32" blooming mill, largest of any of Bethlehem Pacific's rolling mills, will receive ingots from the new soaking pits which have a rated capacity of 80 tons of ingots per hour. These facilities are expected to be in production by the first of the year.

Other facilities under construction at the Los Angeles plant are a high speed bar and rod mill and a new general office building for all Bethlehem Pacific's interests in the Los Angeles area. The new bar and rod mill will produce a full range of wire rods, a wide range of bars including rounds, squares, flats, spring steel sections, angles and reinforcing bars. The new wire mill, which will cost over $2,000,000, will produce bright wire and annealed wire.

Production from this mill will be used by West Coast wire fabricators of such articles as racks, baskets, wire forms, and numerous other specialties in addition to a large tonnage being supplied to jobbers who will distribute the annealed wire in coils to various organizations who will use it for bundling and box tying applications.

The total expansion program for Bethlehem Pacific to date shows over $14,000,000 being spent in the Los Angeles area, approximately $1,000,000 in the Bay area and about $500,000 at the company's Seattle plant.

Type "SS" Diesel Engines

A new 2-color flier, Form 10311, describing its new Type SS Turbocharged Diesel Engines, has been issued by Ingersoll-Rand. These new engines are built in three sizes, 6 cylinder, 675 hp; 7 cylinder, 785 hp; and 8 cylinder, 900 hp.

The front cover view clearly illustrates the fully enclosed engine, emphasizing its clean, smooth lines, the accessibility of filters and control.

The inside spread is devoted to HP ratings, fuel consumption curves, and the listing of new feaures and improvements. An excellent comparison of the space requirement of the Turbocharged SS and an unsupercharged engine is clearly presented.

On the back page of this flier a table and diagram listing ratings and dimensions is shown.

Additional information may be obtained or a copy of the flier may be had by writing Ingersoll-Rand, 11 Broadway, New York 4, N.Y., or any of its many branch offices located throughout the world.

Alondra Well Starts Swabbing

British-American Oil Prod. is swabbing for production with Bodger No. 4 in Sec. 22-3s-14w at Alondra. The hole was plugged back from 9132 ft. to 9020 ft. Village Comm. No. 1 in the section is building rig. General Petroleum's Alondra Comm. No. 8-1 is a rig.

East Whittier Try Goes Ahead

Livingston Drilling & Dev. Co. is drilling at 7020 ft. with Dewey No. 1 wildcat test in Sec .1-3s-11w on ground east of Whittier.

Hydraulic Pressure to Cement Plugs

(Continued from Page 23)

then used to break up the cement plug and the drillable bridging plug below after which the well was returned to production.

In the last two tests made in the 8⅝" O.D. size, a collar recess was provided in which the cement could lodge by screwing a collar and a short nipple below the piece of casing used for the tests so as to demonstrate the locking effect of collar recesses. In the last test made, which was in the 8⅝" O.D. size, the high pressure connections blew out at 3000 p.s.i but the plug had not moved at this pressure.

After the plugs started to move there was a decline in the pressure required to keep the plug moving, as it was being ejected from the open end of the casing nipple and thereby diminishing the area in contact with the casing. This diminishing in pressures appeared to be reasonably constant except in a few instances when the fluid channelled by the cement plug and the pressures and the rate of ejection were difficult to observe or control.

It should perhaps be called to the reader's attention that circumferential areas (wall area of contact between plug and casing) do not increase in the same proportion as cross-sectional areas for any given length of plug. No tabulation was made of the total weight put against the plug or its equivalent in a standing column of fluid, but these may be arrived at from the column under "P.S.I. Required to Move Plug."

Western Petroleum Refineries

According to recent statistics, California now has 53 refineries with a total daily crude capacity of 939,050 barrels. The daily cracking capacity is given as 593,300 barrels. Six of the refineries have lubricating oil manufacturing units, while 24 are equipped with catalytic cracking plants.

Colorado has 7 refineries, with a total daily capacity of 15,000 barrels; and a cracking capacity of 7,490 barrels. Six of the plants have catalytic crackers.

Idaho has one refinery with a daily crude capacity of 2,100 barrels, and a cracking capacity of 530 barrels. This installation also does catalytic cracking.

Montana has 10 refineries with a daily crude capacity of 40,400 barrels, and 19,050 barrels daily for cracking. Seven of the plants do catalytic cracking.

New Mexico has 8 refineries with a daily capacity of 13,150 barrels, and a cracking capacity of 4,850 barrels. Four of the plants can crack catalytically.

Utah has 4 refineries with a daily crude capacity of 23,400 barrels, and 16,100 barrels daily for cracking. One plant manufactures lubricating oils; and 2 plants do catalytic cracking.

Washington has one refinery with a daily crude capacity of 6,000 barrels, and a cracking capacity of 2,500 barrels. Catalytic cracking is also done.

Wyoming has 21 refineries with a daily crude capacity of 77,080 barrels, and a daily cracking capacity of 37,450 barrels. Two of the plants make lube oils; and 9 of them do catalytic cracking.

Cycling at High Pressure

(Continued on Page 29)

same fields and based on information and experience available it is the author's opinion that the present systems of condensate recovery in general use should be continued until more experimental data is available and the correlation of such data, when recognizing such factors, indicates changes should be made.

6. Conservation as generally understood in the oil industry is the elimination of physical waste—and since neither of the methods of operation discussed in this paper create waste, both will comply with all the conservation regulations generally in effect. Operations for conservation alone are not necessarily practical or economical, and when practical and economical considerations are applied to cycling operations it will be seen that high pressure cycling rather than depletion and evaporative sweep will predominate.

REFERENCES

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(3) J. O. Lewis, A. I. M. E. February 1946.

(4) Olds, Sage and Lacey, Trans. A. I. M. E. 1945.

C.N.G.A. October Meeting

STATEMENT OF OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933.

Of California Oil World, published twice-monthly at Los Angeles, California, for October 1, 1947. State of California, County of Los Angeles, ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Walter C. Monroe, who, having been duly sworn according to law, deposes and says that he is the President and Business Manager of the California Oil World, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Walter C. Monroe, 765 S. Plymouth Blvd., Los Angeles 5, Calif. Editor, Walter C. Monroe, 765 So. Plymouth Blvd., Los Angeles 5, Calif. Managing Editor, None. Business Manager, Walter C. Monroe, 765 So. Plymouth Blvd., Los Angeles 5, Calif.

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WALTER C. MONROE
(Signature of editor.)

Sworn to and subscribed before me this 2nd day of October, 1947.

(SEAL) BERTHA EICHEL.
(My commission expires Nov. 28, 1947.)